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ABSTRACT

This document is the second part in a report on longitudinal evaluations of preschool programs. Part I reviewed long-term, controlled studies in order to generally assess the impact of preschool intervention. Part II reviews follow-up data in order to resolve the following five questions: (1) Do children in experimental programs continue to gain in intellectual development as long as intervention continues?, (2) Are gains increased or maintained after termination of the programs?, (3) Is development enhanced by beginning intervention at earlier ages, including the first years of life?, (4) What kinds of programs are most effective for long-range impact?, and (5) Which children from what circumstances are most likely to benefit in the long run from early intervention? The report includes discussion of the nature and limitations of the data used, methodological problems, effects of preschool intervention in group settings, effects of home-based intervention, a sequential strategy for early intervention, and the ecology of intervention, in which focus is on the characteristics and problems of disadvantaged families. (DP)

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A REPORT ON LONGITUDINAL EVALUATIONS OF PRESCHOOL PROGRAMS

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Volume II
Is Early Intervention Effective?

A REPORT ON LONGITUDINAL EVALUATIONS OF PRESCHOOL PROGRAMS

VOLUME II: IS EARLY INTERVENTION EFFECTIVE?

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IS EARLY INTERVENTION EFFECTIVE?[1]

Urie Bronfenbrenner

I. THE PROBLEM

It is now a decade since early intervention began to be applied as a strategy for counteracting the destructive effects of poverty on human development. This approach had its roots in an emergent body of theory (Hebb 1949) and research in the 1950's pointing to the beneficial effects of early stimulation both in animals and humans.[2] The implications of this work for education in early childhood were developed in a highly influential book by Hunt (1961). Additional support for Hunt's thesis came from Bloom's widely quoted but questionable conclusion, based on an analysis of the impressive predictive power of IQ scores obtained by five years of age, that "about 50 percent of intellectual development takes place between conception and age 4." (Bloom 1964, p. 88)

It was in this context that the first well-designed experimental programs of preschool intervention were instituted by Kirk (1958), Gray (Gray and Klaus 1965), and Weikart (Weikart, Kamii, and Radin 1964), and produced dramatic initial gains of up to 15 or more IQ points in the space of a few months. Primarily for reasons of social policy rather than demonstrated scientific validity, these experiments were followed almost immediately by the widespread adoption of programs at the state and federal level, most notably Head Start. As a result, the critical question of the long-range effect of early intervention was by-passed, at least temporarily.

In the meantime, researchers continued their work. They not only replicated their initial results with new groups of children but also began to gather information on the performance of "graduates" of the program after they had entered school. Such follow-up data have recently become available from more than half-a-dozen preschool projects. The results can shed some light on five questions of considerable scientific and social import:

1. Do children in experimental programs continue to gain in intellectual development so long as intervention continues, or at least do they maintain the higher level achieved in the initial phase?

[1] To an extraordinary degree, the author has been indebted to his colleagues in the preparation of this analysis. All of the original research reported here was done by others. In addition to printed material, Drs. Phyllis Levenstein, Earl Schaefer, and Susan Gray, generously provided as yet unpublished follow-up data from their projects. Dr. Levenstein also carried out a number of supplementary analyses to clarify points in question. Especial appreciation is expressed to Dr. Lois-Ellen Datta of the Office of Child Development, who brought to my attention important studies published only as reports to sponsoring agencies and gave me the benefit of her unparalleled knowledge of research in the area and her balanced judgment on issues both of science and social policy. Thanks are also due to Dr. Joan Bissell, Dr. Boyd McCandless, and Carmela Mondelli for invaluable assistance.

[2] For an analysis of these studies, see Bronfenbrenner 1968*a*.

2. Do children continue to improve, or at least to hold their own, after termination of the program, or do they regress to lower levels of function once the program is discontinued?
3. Is development enhanced by beginning intervention at earlier ages, including the first years of life?
4. In terms of long-range impact, what kinds of programs are most effective?
5. Which children from what circumstances are most likely to benefit in the long run from early intervention?

II. THE NATURE AND LIMITATIONS OF THE DATA

Follow-up data are available from two types of early intervention projects. The first and more familiar approach centers on a preschool program conducted in a group setting outside the home. A second strategy, used both independently and as supplementary to the first, involves a regularly-scheduled home visit by a trained person who works both with the child and his parents, usually the mother.

Criteria for the Selection of Projects

In selecting studies of either type for inclusion in the primary analysis, we have employed three criteria: (1) systematic follow-up data must be available for at least two years after termination of intervention; (2) similar information is provided for a control group matched on relevant personal characteristics (e.g. age, ability) and background variables (e.g. social class, race); and (3) the data must be comparable from one project to another. The rationale for each of these criteria is self-evident. Two years was regarded as a minimum for gauging long-range after-effects of the program. A control group is necessary in order to determine whether observed changes are specifically attributable to the intervention program as such, rather than to external circumstances or events. As we shall see, the necessity of a control group is confirmed by evidence from the studies to be examined of changes in IQ, both in experimental and control groups, as a function of conditions independent of the intervention procedures themselves. Finally, the comparability of data across projects is essential for assessing the relative effectiveness of different intervention strategies.

Limitations of the Data

These three criteria, necessary as they are, unavoidably have the effect of restricting the number of projects that can provide a basis for analysis and, what is even more regrettable, the kind of data that can be examined. Information available across the board is limited to the cognitive area only and consists of IQ scores on the Stanford-Binet (with a few exceptions as noted) and, once the children have entered school, measures of academic achievement on standardized tests. Since different tests were used for this purpose in the various projects, the raw scores on subtests were converted into grade equivalents and averaged, yielding a single score that permitted some comparability from one project to the next.

The restriction of available data to measures of this type sets important limitations to the conclusions that can be drawn. First, there are many important aspects of the development of the human being besides the intellectual, especially the particular kinds of cognitive skills measured by standardized tests. In terms of the child's fulfillment as a person, such factors as emotional security, self-esteem, and the realization of special talents may be no less important than intellectual performance.

As for the social realm, especially in our times, such qualities as generosity, cooperativeness, responsibility and compassion may be of greater moment both to self and society than the ability to perform the restricted kinds of cognitive tasks called for in objective tests. These tasks are especially circumscribed in tests designed for children at the preschool and primary levels (to which our data are limited) in which the emphasis is much greater than it is at older age levels on items requiring recognition of and information about particular objects, pictures, and words with which the child is presumed to have prior familiarity. Thus at these earlier age levels, even the Stanford-Binet reflects substantial components of acquired knowledge, skill, and simple rote learning. The last factor is even more pronounced in the tests of academic achievement currently available for kindergarten and primary levels. Futhermore, since the kinds of objects and facts with which the children are expected to be familiar are far more common in middle class than in less favored environments, the obtained results may often underestimate the potential of children from disadvantaged families. There is also the question of whether the forms

of preschool intervention which are most successful in raising the child's performance on objective tests may do so at the price of inhibiting the development of other desirable human qualities, including even such intellectual functions as critical analysis, curiosity and creative thought. We shall consider some evidence bearing on this issue later in the report.

In the light of all these considerations, *it is of the utmost importance to recognize that the failure of one or another form of preschool intervention to increase or maintain the levels of performance in objective tests of intelligence or achievement must not be interpreted as evidence that such programs are not contributing in important ways to the development and welfare of the child, and for that matter, of his family, community, and even the society as a whole.* All these programs have important objectives outside the purely cognitive sphere, and even within that area, these objectives are broader, deeper, and more humane than the restricted aspect of the child's performance measured by standardized tests, especially the kinds of tests used at younger age levels.[3]

Nevertheless, bearing all these caveats in mind, the available data are not without considerable scientific and social significance. There are few scientists or citizens who would dismiss as inconsequential the demonstration that a particular form of early intervention can enable children to solve problems of the type presented on tests of intelligence at a level of competence comparable to that of the average child of the same age. Whereas performance below the norm on tests of this kind cannot be taken as firm evidence that the child lacks mental capacity, attainment of the norm year after year does mean that the child both possesses intellectual ability and can use it. As we have pointed out, it would be necessary to insure that the method of intervention employed did not have adverse effects on other aspects of development. But given this assurance, the discovery of such a method would be a significant achievement. It is from this perspective that the present analysis was undertaken.

[3] The development in recent years of reliable observation techniques for assessing the cognitive, emotional, and social behavior of young children in natural settings (e.g. Schoggen and Schoggen 1971) gives promise that in the near future we shall have valid evidence regarding the effects of early intervention on other important aspects of the child's development beyond those measured by conventional tests of intelligence and achievement.

Description of Programs. There are seven projects which meet the criteria we have set. Five involve intervention primarily in preschool settings; two are home-based. A summary of each program is provided in Table 1. The first entry supplies basic identifying information, including the name of the project, the locale, the principal investigator, and the sources from which basic data were obtained. The remaining sections described the sample, the nature of the intervention, and the selection and character of the experimental and control groups. Included in the description of the sample are the criteria employed for admission to the program, as well as any available information on the extent of attrition both in terms of self-selection prior to the beginning of the intervention and drop-out rate over the course of the program.

Supplementary Sources. Especially in view of the small number of projects that conformed to the specified conditions, we shall also draw on the results of other intervention studies which failed to fulfill one or another of our three requirements but provided evidence that could be used to challenge, confirm, or clarify conclusions drawn from the primary investigations. There are twenty such additional researches which fall into three general categories. The six studies in the first group are evaluations of experimental preschool programs. Deutsch and his colleagues (1971) have reported results from a five-year intervention effort, beginning at age three and ending when the children were in the third grade. Unfortunately, no funds were available either to continue the program or conduct a follow-up. Karnes (1969) and her colleagues (Karnes, *et al* 1972) have conducted an admirable comparative study of the effectiveness of different preschool curricula: there are follow-up data for three years after termination, but no untreated control group was included in the experimental design. Sprigle and Van De Riet's (Sprigle 1972; Van De Riet 1972) "Learning to Learn" program is still under way so that follow-up data are available for one year only. Di Lorenzo (1969) has carried out a comparative study of preschool programs in eight New York State communities but the two year follow-up focused only on academic achievement with no data on intelligence. Finally, two large scale investigations have been conducted comparing different education strategies employed in two nation-wide intervention programs, Head Start (Bissell 1971) and Follow Through (Stanford Research Institute 1971a, 1971b; Soar, 1972).

Table 1

Identifying Data	Sample	Nature of Intervention	Experimental and Control Groups
Howard University Preschool Program Washington, D.C. Elizabeth Herzog (Herzog, Newcomb, and Cisin, 1972a, 1972b; Kraft, Fuschillo, and Herzog, 1968)	Black children in generally good health from families selected at random from four census tracts in Washington inner-city neighborhoods. All parents had to agree in advance to have their children attend the preschool program if selected. No other requirements. Approximately 68 percent of families below poverty line; 18% on welfare, median income about $3,500 but extending up to $10,000. About 25% of parents graduated from high school, 90% unskilled labor, remainder skilled and semi-professional. 28% of the mothers worked, and apparently all of the fathers when present. No father in 40% of the homes. Median number of children in the family 4. The "no-show" rate was over 30% during the recruitment phase, but attrition was very low thereafter.	"A well-run middle class nursery school, with no specific 'enrichment' features." Children attended full day for 5 days a week. Each group of twelve had its own teacher and two or three teachers' aides. Weekly parent meetings were held at the university plus individual contacts with families, usually unscheduled. In the hope of consolidating any benefits...a series of special school situations was arranged for the 30 experimental children during the three years immediately following nursery school. These included being in the same class in kindergarten, extra teachers and aides, an enriched curriculum, special trips, and assignment of a social worker to the children's families.	30 children from one census tract were designated as the experimental group and 69 from the other three tracts as the control group. The experimental group ended up with a higher percentage of intact families (66% versus 16%), and slightly smaller families.
Perry Preschool Project, Ypsilanti, Michigan David P. Weikart (Weikart, D.P., et. al., 1970; Weikart, 1967)	Black children from disadvantaged homes residing in a city of 50,000 on the fringe of metropolitan Detroit. To qualify all children had to have IQ's between 50 and 85 with no discernible organic involvement. In addition, families had to fall below a low cutting point on a cultural deprivation scale based primarily on parents' education and occupation, and also number of persons per room in the home. Parents' education averaged below tenth grade; occupations over 70% unskilled; half the families are on welfare; no information on income; 14% of fathers unemployed. Average number of children in the family 4.8: 48% of the children have no father in the home; about 28% working mothers. There appears to have been little self-selection of families in the sample and attrition during the course of the project has been low.	Half-day classes, five days a week, from mid-October through May for two years. Curriculum derived mainly from Piagetian theory and focused on cognitive objectives. Four teachers for each group of 24 children with emphasis on individual and small group activities. Teachers made weekly 90-minute home visit "to individualize instruction through a tutorial relationship with the student and to make parents knowledgeable about the educative process...mothers are encouraged to observe and participate in as many teaching activities as possible during the home visits."	Children from the total sample were divided at random into experimental and control groups with some adjustment to assure matching on social class, IQ, boy/girl ratio, and percent of working mothers. The groups appear to be well matched on other variables as well. Although there were 5 waves of experimental and control groups initiated over a period of years, the waves have been pooled in reporting follow-up data.

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Table 1 (Continued)

Identifying Data	Sample	Nature of Intervention	Experimental and Control Groups
Early Training Project Nashville, Tennessee Susan W. Gray (Gray and Klaus 1970; Klaus and Gray 1968)	Black children from families "considerably below" the poverty line. Selected on the basis of parents' occupation (unskilled or semi-skilled), education (average below eighth grade), income (average $1,500), and poor housing conditions. No data on welfare status or percent of parents unemployed; one-third of the homes with no father; median number of children per family 5. Both self-selection of families at entry and attrition over the course of the study appear to have been minimal.	In summer, daily morning classes emphasized the development of achievement motivation, perceptual and cognitive activities, and language. Each group of nineteen had a black head teacher and three or four teaching assistants divided equally as to race and sex. In dealing with the children, staff emphasized positive reinforcement of desired behavior. The weekly home visit stressed the involvement of the parent in the project and in activities with the child. Home visits lasted through the year.	Sixty-one children from the same large city were divided at random into two experimental groups (E1 and E2) and one control group (C1). The remaining control group, (C2), consisted of twenty-seven children from like backgrounds residing in a similar city 65 miles away. Group E1 attended the ten-week intervention program for three years of weekly meetings with a trained home visitor when preschool was not in session. Group E2 began the program a year later with only two years of exposure.
Philadelphia Project Temple University E. Kuno Beller (1972)	Children from urban slum areas of North Philadelphia, 90% Black. Families in target mainly employed in unskilled or semi-skilled labor with median income of $3400. Children admitted to the nursery group were selected from families responding to a written invitation, who also meet the following criteria: "dependency of family on public services, mothers working, and broken homes." Kindergarten group consisted of children from the same classroom attended by nursery children, but without prior nursery experience. First grade group was composed of children entering the same classrooms but without prior nursery or kindergarten experience. Attrition was 10% by the time the original groups reached fourth grade.	Nursery groups composed of fifteen children with one head and one assistant teacher for four half days a week, with a fifth day devoted to staff meetings, teacher training, and parent conferences. "The program was a traditional one" emphasizing "curiousity for discovery. . .croativity. . .warm, personalized handling of the child. . .balance of self-initiated instructed activities." Kindergarten and first grade classes consisted of twenty five to to thirty children, meeting five half days a week, with one head teacher and an aide or assistant teacher. Work with parents and home visits were conducted by a home-school coordinator.	A major purpose of the research was to examine the effect of age at entry into school by examing intellectual development of three comparison groups starting in nursery, kindergarten, and first grade respectively. Groups were matched on age, sex, and ethnic background. No data are available on comparability of of the three groups in terms of education, socioeconomic status, or family structure. Comparison at time of entry into school, on three different tests of intelligence and on other psychological measures however, revealed no significant differences. The children from all three groups attended the same classrooms through Grade II, but by Grade III children were dispersed over many schools.

Table 1 (Continued)

Identifying Data	Sample	Nature of Intervention	Experimental and Control Groups
Indiana Project Indiana University Bloomington, Indiana Walter L. Hodges (Hodges et al. 1967)	Five year old children in good health predominantly White from Bloomington and from small semi-rural Indiana communities selected on the basis of low-rated "psychosocial deprivation," and Binet intelligence score between 50 and 85. Average length of schooling for parents just below tenth grade. No information on welfare status or income. Fathers' occupation approximately 70% unskilled and 8 percent semi-skilled; 12% unemployed; one-third of the mothers work; 20 percent of the homes have no father present; average number of children in the family 5; no information is available on the degree of self-selection among sample families. There was only one slight attrition over the course of the study.	Group E1 was exposed to a special "diagnostically-based curriculum" designed to remedy specific deficits of individual children through "an intensive, structured, cognitively-oriented" program. The children met daily for morning sessions. To increase the likelihood of adoption of the program by the public schools, "the teacher to child ratio was smaller in the present study than that reported in the other preschool projects. . .For the same reason, no work was done with the families of the subjects."	One experimental group (E1) and control group (C2) were constituted by random assignment, Group E1 attended one year of the specially-designed kindergarten program in Bloomington. C2 was composed of at-home controls from the same city. Children in Group C1 attended regular kindergartens newly established in several semi-rural Indiana towns. This was a "traditional kindergarten," providing facilities and equipment similar to those for C2, but without the special "diagnostically evolved" curriculum. Group C3 consisted of at-home controls in these same localities. In general, the families in the experimental group were rated by investigators as more disadvantaged than those in the control group but this difference is not reflected in indices of socioeconomic status, family size, parents' education, or occupation.
Infant Education Research Project Washington, D.C. Earl S. Schaefer (Schaefer 1972a, 1968; Schaefer and Aaronson 1972; Infant Education Research Project, undated)	Fifteen month old Black male infants selected from door-to-door surveys of families in two low socioeconomic innercity neighborhoods in Washington. To be accepted families had to meet four criteria: (1) income under $5,000; (2) mother's education under twelve years; (3) occupation either unskilled or semi-skilled; and (4) willingness to have infant participate in either the experimental or control group. In addition, "an attempt was made to choose participants from relatively stable homes, not so noisy or overcrowded as to interfere with the home tutoring sessions." No other background information available. Of the 64 subjects in the original sample, 48 (equally divided between experimental and control group) were available for the final follow-up.	Trained tutors worked with each child in the home for one hour a day, five days per week, from the time the child was 15 months old until three years of age. The main emphasis was on development of verbal and conceptual abilities through the use of pictures, games, reading and puzzles. "Participation of the mother and of other family members in the education of the infant was encouraged but not required."	Chosen from different neighborhoods to avoid contamination. "Comparisons between the groups revealed only small differences, many of which favored the control group, on the family variables that might be expected to influence the child's intellectual development."

Table 1 (Continued)

Identifying Data	Sample	Nature of Intervention	Experimental and Control Groups
Verbal Interaction Project Mineola, New York Phyllis Levenstein (1972a, 1970)	Infants 2 to 3 years of age, 90% Black, from disadvantaged families in three Long Island suburbs. To qualify mothers had to be eligible for low income housing with an education not higher than high school graduation. About 25% of the families were on welfare. Average education of parents was eleventh grade; fathers apparently all employed; about 65% unskilled or semi-skilled. About 35% of mothers work; 30% of the fathers absent. Average number of children per family, 3-4. Self-selection involved in willingness of mothers in experimental group to participate. Attrition especially high in untreated control groups. Average IQ of mothers of children in the experimental groups was 83; in the control group 88.	Semi-weekly half-hour visits in the home for seven months each year by trained worker who stimulated interaction between mother and child with the aid of a kit of toys and books referred to as VISM (Visual Interaction Stimulus Materials).	Randomized by housing project. The several experimental and control groups differ on age of entry into the program (2 vs. 3, see Table 3), length and intensity of intervention, and prior experience. Groups E1 and E2 had one year of the regular program at two years of age followed by a much abbreviated program in the second year as follows. Group E1 received seven visits in which the focus of attention was on the kit of materials with no involvement of the mother in interaction with the child. Group E2 was given the regular program but with half as many visits as in the first year. Group E3 received the full program for two years beginning at two years of age. Groups E4 and E5 were both given one year of the regular program at age three, but Group E5 had served the previous year as a "placebo" control group which had received the semi-weekly visits but without exposure to the special kit of materials or encouragement of mother-child interaction. The visitor simply brought a gift and played records for the child. Seven of the eight groups are generally comparable on major background variables, but one control group (C2) was far out of line — with better educated mothers, smaller families, higher occupational status, no absent fathers, etc.

A second group of eleven studies analyzed effects of parent-intervention, particularly as this strategy related to preschool programs. A series of investigations by Karnes and her colleagues (Karnes 1969; Kirk 1969; Karnes *et al*. 1968, 1969a, 1969b, 1969c, 1970) and an experiment carried out by Gilmer *et al*. (1970) are especially valuable in this regard. Two researches by Radin (1969, 1972) provide important evidence on the interaction between parent intervention and group programs at the preschool and kindergarten levels, and Smith (1968) documents the only research we have been able to find on the effects of parent-intervention in elementary school through sixth grade. Although only one (Gilmer *et al*. 1970) of these studies involves any follow-up after termination of the program, all have been included because their careful experimental design permits clarification of the independent and joint contributions of different intervention strategies.

A third group of studies (Rehabilitation of Families at Risk for Mental Retardation 1971; Skeels 1966; Skodak and Skeels 1949) understandably small in number, describe more radical intervention strategies in which primary responsibility for the care and upbringing of the child was entrusted to some one other than his own parents. A description of each of the foregoing intervention programs will be provided when the result are presented.

Finally, in order to understand the processes underlying particular intervention strategies and their relative effectiveness, this analysis draws heavily on basic research in child development, particularly investigations of socialization processes as they affect cognitive growth in early childhood.

III. SOME METHODOLOGICAL PROBLEMS

Certain features of the data presented in Table 1 merit special attention because they point to problems of experimental design that have important bearing on the interpretation of results. We shall first describe these features and then examine their methodological implications.

1. *IQ as a Criterion of Selection.* In two of the studies (Weikart and Hodges), only those children were included in the sample who fell within an IQ range of 50 to 85. None of the other studies imposed this kind of requirement.
2. *Insuring Parental Motivation.* A number of the programs accepted for admission only families who had agreed in advance to enter their children in the intervention program if they were chosen for the experimental group (Herzog, Schaefer, Levenstein). Other projects did not exact such prior commitment.
3. *The Factor of Age.* In the majority of the programs intervention began when the child was three years old, but there was some variation both across and within projects. Schaefer's subjects were 15 months old, three of Levenstein's experimental groups began with two-year olds, Beller's youngest comparison group entered preschool at age four as did one of Gray's groups (E_2), and the Hodges project began at the kindergarten level. This means that, at the end of follow-up, Schaefer's and Levensteins's subjects were only entering school, whereas the children in the Weikart, Beller, and Gray studies were already in third and fourth grade.
4. *Differences in Degree of Deprivation.* Although the children in every study came from disadvantaged homes, there was still some variation in the degree of deprivation and related characteristics from one sample to the next. Specifically:
   a) Gray's program appears to have reached the least favored families. The sample is described as "considerably below the poverty line," with no mothers receiving more than an eigth grade education (as compared with an average of tenth grade or higher in the other projects).
   b) Next in line are the Hodges, Weikart, and Beller[4] programs, where the families were somewhat better off but still limited in educational and occupational level.
   c) In the two Washington projects (Herzog and Schaefer) there is evidence of less stringent circumstances as well as selectivity on motivational grounds. Both studies required willingness to have the child participate in the

[4] In the absence of specific background data on parents' education and other background characteristics, especially for the self-selected experimental group, it is difficult to access the degree of deprivation for this project. The median income is considerably higher than that for Gray's project ($3,400 versus $1,500), but the sample is drawn from an urban slum area, where the cost of living would be appreciably higher. At the same time, in contrast to the Washington projects, all families were not preselected for willingness to have their children participate in an intervention program.

intervention program regardless of whether he ended up in the experimental or control group. In Herzog's sample, though the families came from inner-city neighborhoods, only 18 percent were on welfare (in comparison to 50 percent for the Weikart project) and some had incomes as high as $7,000 to $10,000. Schaefer's families, while not exceeding a $5,000 income, were restricted to "relatively stable homes" in which tutoring could be successfully conducted. There is also the probability of some self-selection in terms of allowing a tutor to come into the home.

d) At the upper end of the continuum is Levenstein's sample, with parents' education averaging eleven years, small families, and considerable self-selection in terms of mother's willingness to participate in the at-home sessions. Nevertheless, there is no doubt that the families represented a disadvantaged group, since the average IQ of the mothers was about 85.

5. *Forming Experimental and Control Groups.* The latter were of four different types.

   a. *Randomized local control groups.* These were created by randomly assigning children to a treated or untreated group from a relatively homogeneous parent sample of families living in a particular neighborhood.

   b. *Non-random local control groups.* In the Belier study, comparison groups consisted of children in the same classes who had not had preschool experience.

   c. *Georgraphically randomized control groups.* In the Herzog, Schaefer, and Levenstein studies experimental or control status was randomly assigned to groups living in different but comparable neighborhoods in the same or different communities.

   d. *Non-randomized distal control groups.* Gray and Hodges each set up one control group in another but similar community. No random selection was involved.

We now turn to a consideration of the relevance of each of these factors for the interpretation of results, beginning with one that introduces an artifact into the data.

The effect of initial IQ level.

If only those cases are included in the sample who fall below a specified IQ score, the increase obtained at the next test period is likely to be spuriously high. The artifact comes about in the following fashion. Children falling below the cutting point on the first screening test are likely to include some who obtained a low score for fortuitous reasons (for example, fatigue, distraction, or emotional disturbance). At the time of the second test, these children tend to do better, and thus raise the mean score of the entire group by some amount over and above any impact of intervention. This phenomenon, commonly known as *regression to the mean*, introduces a spurious element into all studies in which IQ is used as a basis both for the selection of subjects and the evaluation of their progress. Because the cut-off point is applied to the entire sample, the operation of the artifact is manifested by the presence not only of a marked gain for children exposed to intervention, but an appreciable though smaller increase for the control group as well. Since one can never rule out the possibility that both the experimental and control groups are being influenced, as in this instance, by some common factor, the appropriate measure of the impact of intervention over time is not simply the gain achieved in the course of the program but the difference between this gain and any corresponding change in the control group over the same period.[5]

The phenomenon of regression to the mean explains the finding commonly reported in intervention studies that the children in the program who show the largest IQ gains are those with the lowest initial IQ scores. For example, in a study by Karnes (1969) children from disadvantaged backgrounds entering five different preschool intervention programs were stratified on the basis of their intelligence quotients into three groups: IQ scores of 100 or above, 90 through 99, and 70 through 89. At the end of the first year, the average gain, across all five programs, for the lowest ability group was approximately twice that for children with beginning IQ's of 100 or above. The same ratio of 2 to 1 still

[5] This procedure also takes into account the tendency of both experimental and control groups to show some gain because of practice effect.

obtained in comparing overall gains two years after completion of the program. A similar effect was found in the Herzog project included in our primary analysis (Herzog *et al.* 1972a, 1972b). The investigators divided the sample at the median in terms of initial IQ scores. Over the two years of preschool intervention, the children in the low ability group (IQ below 80) showed a gain of 21 points compared to 9 for those having IQ's of 80 or over. Results of this kind suggest the optimistic conclusion that, among disadvantaged children, it is those with the lowest IQ's who can benefit most from early intervention. As we have already seen, however, such a conclusion is warranted only if there has been adequate control for spurious gains produced by regression to the mean. In addition, it is desirable to reduce error variance by selecting samples on the basis of multiple criteria rather than of a single test score. To this writer's knowledge, the only research approaching these requirements is the Herzog study. In Table 2 of their reports (Herzog *et al.* 1972a, 1972b), the investigators present results for both experimental and control subject of low and high ability. At the end of intervention the difference in gain between experimentals and controls was higher by 6 points for the children of lower IQ, but the effect was not tested for statistical significance and washed out by the time the children were in second grade. Thus the available evidence does not yet justify the conclusion that disadvantaged children with the lowest IQ's benefit most from early intervention.

The Role of Age

As a number of investigators have pointed out (Bloom 1965, Coleman 1966, Deutsch 1960, Di Lorenzo 1969, Hayes and Grether 1969, Schaefer 1972b), the effects of deprivation become progressively greater as the child gets older. In fact, as we shall see in Schaefer's study, before the age of two, children from disadvantaged families tend to obtain normal scores on tests of mental development. Thereafter, the level drops rather suddenly and may continue to decline in environments that are especially impoverished. Moreover, as the disadvantaged child gets older and enters school, he tends to get further and further behind his classmates. With respect to intervention research, this means that for samples from very deprived environments, not only the control group but even the experimental subjects in the program may decline in IQ especially at older age levels. Indeed, programs initiated at older age levels may not produce as large or enduring gains as those begun when the child is only two or three years old.

The effect of variations in degree of deprivation.

The foregoing discussion suggests that intervention may be less effective with children who come from the most disadvantaged homes. Data in support of this conclusion are provided by Herzog and her colleagues (1972a, 1972b) who sought to determine how the child's response to intervention was influenced by the degree of deprivation in his environment. Since all of the children in the program came from disadvantaged families, it was necessary to identify variables that would differentiate levels of deprivation within this relatively homogeneous group. To accomplish this purpose, Herzog and her colleagues utilized a combined index based on two factors: the number of years of education of the child's mother, and the ratio of persons per room in the home. When the sample was divided into a low and high group on the basis of this index, the analysis revealed that children in the relatively less deprived group gained more from the program and retained a larger proportion of their gains. In fact, two years after completion of intervention, only the more favored group showed a statistically significant difference between experimental and control children. The bitter impact of this set of findings is epitomized in the title of the most recent report published by the Herzog group: "Double Deprivation: The Less They Have, The Less They Learn." (Herzog *et al.* 1972b) This harsh dictum conveys a note of fatalism which is not entirely justified, since, as we shall see, the data permit other, more encouraging interpretations. But, for the moment, we are concerned with the methodological implication of Herzog's findings; they indicate that projects involving children from relatively less deprived homes are likely to get more favorable results, both in terms of immediate and long-term outcomes.

The effect of requiring prior commitment.

A similar result appears likely when all families are required in advance to agree to continue in the study regardless of whether they are subsequently assigned to the experimental or control group. Although such a procedure insures greater comparability in motivation of the two groups, it may also have the effect of selecting from the disadvantaged population those parents who have the highest interest and motivation in furthering the development of their children. As a result, children enrolled in programs employing such a criterion may show greater gains. Indeed, the high level of motivation in

Table 2. Effects on Later Intellectual Development of Intervention Programs in Preschool Settings

(Double line designates point at which intervention was terminated.)

	Herzog			Weikart			Gray					Beller			Hodges				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	E	C	E C	E	C	E C	E_1	E_2	C_1	C_2	$\overline{E}C_1$[b]	C	C_1	C_2	E	C_1	C_2	C_3	$\overline{E}C_2$
N	30	66 62		58 13[a]	65 15[a]		19	19	18	23		57 50	53 46	57 53	11	11	13	13	
Age 3 Before	81	85	-4	79 7	79 1	6	87 6	92 5	85 4	86 7	-1 1[c]								
After	91	85	6	95 8	83 4	12 4**	102 0	92 3	88 2	87 4	11 8**[c]								
Age 4 Before							96 4	94 8	89 6	86 7	6 0	92 1							
After	96	88	8**	94 7	82 7	12 0**	97 1	97 5	87 6	84 7	9 7*								
Kindergarten Before															74 5	75 0	74 5	72 5	0
After	97	90	7	90 5	85 4	5 1*	95 8	96 6	82 9	80 2	13 3*[g]	98 6	91 2		93 8	87 5	80 9	81 3	12 9*
Grade I	95	89	6	91 2	83 3	7 9**	98 1	99 7	91 4	89 0	7 5*	98 4	94 4	89 9	97 4	83 2	91 7	84 8	5 4
Grade II	92	87	5	88 8	86 5	2 3	91 2	96 0	87 9	84 6	5 7*	97 8	92 8	88 6	94 9	85 5	89 2	86 5	5 7
Grade III	87	87	0	89 6	88 1	1 5	–	–	–	–	–	97 6	93 1	89 3					
Grade IV							86 7	90 2	84 9	77 7	3 5*[e]	98 4	91 7	88 6					
Initial Gain	10	0	10	16 1	4 3	11 8	14 4	5 0	2 8	7	6 9	6 5*	3 2	1 3	19 3	12 5	6 4	8 8	12 9
Gain 2 Years After	14	4	10	11 5	4 2	7 3	3 6	3 5	2 5	-2 1	1 1	6 3[d]	1 6[d]	-6[d]	20 4	10 5	14 7	12 0	5 7
Overall Gain	6	2	9	9 9	9 0	9	-9	-2 3	-5	-9 0	1 3	6 3[d]	5[d]	-1 3[d]					
Achievement Level	no difference			2 1	6	1 5*[f]	3 7	4 0	3 8	3 4	2	–	–	–	2 1	2 0	1 8	1 5	4

a. N's decrease because only earlier waves reached grade school (see Table 1).
b. Published significance level includes C_1.
c. Intervention began one year later in E_2, hence C_1 includes E_2 for this age group only.
d. Significance of difference not tested.
e. Difference significant for the distal control group (C_2) only.
f. Difference significant for girls only.
g. A reduced parent intervention program was continued through grade one.

such samples may result in increases not only for experimental subjects but for the control group as well, particularly if both are located in the same community so that control families can become informed about the program.

Problems of comparability between experimental and control groups.

The most comprehensive and effective strategy for minimizing any initial differences between experimental and control groups involves random assignment of individual children to one or the other group from a relatively homogeneous sample. This was the procedure followed by Weikart, Gray (C_1 group only) and Hodges (C_2 group only). Elegant as this method is, it entails some problems. First, randomness does not guarantee equality on all relevant variables. To correct for chance discrepancies, the composition of each group can be adjusted, as Weikart did, to insure comparability in such critical factors as initial IQ and socioeconomic level. Even without such adjustment, however, a reasonably satisfactory match is usually achieved as evidenced by comparative data on the social backgrounds of experimental and control groups cited by Weikart (1970), and Hodges (1967).

Even though comparability is achieved initially, it may gradually be lost through selective and differential drop-out rates from the experimental vs. the control group over time. Fortunately, as indicated in Table 1, this did not occur in any of the randomly-created experimental and control groups employed in the studies under investigation.

But the most serious limitation of the strategy of randomization derives from its social consequences. Since the families from a relatively homogeneous sample usually live in the same community, or even neighborhood, and since they show an interest, or at least a willingness, to enroll their children in an intervention program, the members of the experimental and control group are likely to be in communication with each other, and the latter to be influenced by the program indirectly through contagion. In other words, the control group too may show some gains. When this occurs, differences between groups are reduced and the true impact of intervention is underestimated. This phenomenon has been referred to by Gray as "horizontal diffusion." (Gray and Klaus 1970)

One technique for counteracting this effect is to employ control groups that are, at least to some extent, geographically separated. This procedure was employed by Schaefer, Herzog, Levenstein, Gray (C_2 group), and Hodges (C_3 group). The alternative course employed by Gray and Hodges of setting up a control group in another city or town increases the risk of a major source of confounding neatly avoided in the method of random assignment. Clearly all parents in the experimental group must be willing to enroll their children in the intervention program. If families in a control group located elsewhere are not presented with the same real possibility and then matched on their readiness to take advantage of it, marked differences may result in favor of what becomes a more highly motivated, self-selected experimental group.

In neither the Gray nor the Hodges study is any indication given of how children were recruited for the distal control group. The manner of selection is described, however, in a third instance of non-randomized assignment, this one occurring within the confines of a single community. In the Beller project, the nursery group was drawn from disadvantaged families who had responded positively to a written invitation to enroll their children in a preschool intervention program for three-year-olds. The invitation was sent to all parents of children attending four schools in a slum area of Philadelphia. The second comparison group was not formed until the nursery group entered kindergarten, and consisted of children entering the same classes who had not had prior preschool experience. Presumably this group included some families who had received the invitation in the previous year, and others who had not. No information is provided on this score. The third comparison group was not created until both the preceding groups had reached first grade and included only those children who were entering school for the first time. The three groups were matched on age, sex, and ethnic background, but not on parents' education or occupation, or willingness to enroll a child in an early intervention program. The groups did not differ significantly on three tests of intelligence and other psychological measures administered after each group entered school, a fact which Beller (1973) feels demonstrates the absence of sampling bias. In this reviewer's judgment, however, one cannot dismiss the possibility that the parents differed in their aspirations for the child, interest in education, and other social factors usually associated with these motivational variables. Unfortunately, the

study provides no comparative data on the background characteristics of the three samples. The author states: "We did not attempt to find out why some children entered school earlier and others later." (Beller, 1972, page 40). In view of these circumstances, it is impossible to determine to what extent the emerging differences in I.Q. score were due to program or to sample variation.

The bias introduced by failure to control for motivational differences between the experimental and control group may be avoided through the technique employed by Schaefer, Herzog, and Levenstein, of requiring all participants in the study to indicate their prior willingness to enroll their children in an intervention program and then assigning experimental or control status at random from different housing projects or neighborhoods. When the principle of random assignment is applied to groups rather than individuals, there is of course a greater likelihood that the treated and untreated groups may differ by chance on important confounding variables. A dramatic example is provided by the C_2 grouping in Levenstein's study which turned out to be the least disadvantaged of any experimental or control sample included in this analysis.

Some Methodological Hypotheses

In the light of several confounding factors outlined above, it is apparent that certain of the studies presented in Table 1 are likely to yield more gratifying results than others simply by virtue of the character of the sample and the method employed for setting up experimental and control groups. It is instructive to anticipate how these sources of variation may be reflected in particular projects and their respective experimental and control groups. We do so in the form of a series of methodological hypotheses focused on the major issues we have raised.

1. *Regression to the Mean.* Greatest gains in IQ, at least initially, are likely to be shown by the two projects (Weikart and Hodges) that used IQ as a criterion for admission. Similar but smaller increases are also to be expected in the corresponding control groups.
2. *The Effect of Differences in Motivation.* With other factors held constant, emerging differences between treated and untreated groups can be expected to be greater when the control group has been selected without regard to the family's motivation to enter their child in the experimental intervention program. An opportunity for checking this expectation arises in the two projects (Gray and Hodges) that have employed both a randomly-assigned local control group and a distal one established on an *ad hoc* basis.
3. *Variations with Age.* If other factors are held constant, experimental gains and differences between treated and untreated groups should be greater and more enduring for programs involving the youngest children (Schaefer and Levenstein). Declines in IQ, in experimental as well as control groups should be especially marked among older children from the most deprived groups (Gray).
4. *Differences in Degree of Deprivation.* If other factors are held constant, experimental gains and differences should be greater and more enduring in the projects utilizing samples that are most selective in terms of social background and motivation. Conversely, the effects should be smaller and lost more quickly in the more deprived samples. Also, to the extent that control groups exhibit systematic changes over time, they should parallel the above trends in reduced degree. In the light of the evaluation of relative deprivation made in the preceding section, IQ gains and differences should be greatest for the Levenstein project with the Schaefer, Herzog, Hodges, Weikart, Beller, and Gray programs following in that order.

It should be noted that some of the foregoing methodological hypotheses predict contradictory results, whereas others offer alternative grounds for expecting the same finding. In the latter case, we can of course expect no resolution of the issue. Moreover, even when a methodological effect is present, it may be overridden by genuine differences in program effectiveness. We are faced, therefore, with a difficult and hazardous task of analysis. With but seven studies typically including no more than one experimental and one control group, any inferences are subject to substantial sampling errors, not to mention errors of judgment. But, on the premise that some imperfect knowledge carefully considered is better than none, the task appears worth undertaking. Besides, both the writer, and, hopefully his readers, are impatiently curious: What do the data say?

IV. SOME EFFECTS OF PRESCHOOL INTERVENTION IN GROUP SETTINGS

What the data say with respect to the results of group intervention is shown in Table 2. For each study, the table records the number of subjects, IQ's achieved in

successive years by experimental and control or comparison groups, and the differences between them. The scores given first are those obtained by both groups before the program began. A double-line indicates the point at which intervention was terminated. At the bottom, major changes over time are summarized in terms of initial gain (before-after difference in the first year of treatment), gain two years after all intervention was terminated, (shown because it permits a comparison of all seven studies), and overall gain (difference between initial IQ and last follow-up score three to four years after the children left the program). Also shown are differences between these gains for the experimental, control, and comparison group. Finally, the bottom row records the average grade equivalent attained on a test of academic achievement administered in the final year of follow-up. Unless otherwise noted, significant differences between experimental and control groups for each year are designated by asterisks, one for the five percent level and two for one percent. The absence of asterisks indicates that the difference was not reliable. Ordinarily no significance tests are available for gain scores, but these are shown in the few instances when they were computed by the original investigator.

General Trends

The results themselves exhibit two striking and consistent patterns; one of them is heartening, the other not so. First, it is clearly evident from every project that preschool intervention is effective in producing substantial gains in IQ that are generally maintained so long as the program lasts. And therein lies the more sobering message. By and large, the experimental groups do not continue to make gains when intervention is continued beyond one year, and even more regrettably, the increases achieved in the initial phase, even the largest ones, tend to "wash out." In general, one year after intervention is terminated, the IQ of the "graduates" begins to drop, the difference between the experimental and control groups gradually decreases, the once impressive gains are reduced to a few points, and, what is most crucial, the average IQ of the experimental group often falls back into the problem range of the lower 90's and below.

The regressive trend is most apparent in the two projects that have followed their subjects the longest after school entry – up to four years after completion of the program. In the Weikart study, which involved two years of intervention beginning at age 3 with a gain of 14 points in the first year, the experimental and control groups differed by only 1.5 IQ points by the time the children were in the third grade.[6] Although the Gray study still shows a statistically significant difference between experimentals and controls in the fourth year of follow-up, the results are even more disappointing, for, if IQ score is taken as a criterion, both of the experimental groups end up no better off than they were when they started seven years earlier. The first experimental group, which had entered a three-year intervention program with an average IQ of 88, rose to a high of 102 within the first year, but began to fall while the children were still in the program and by fourth grade had dropped back to its original level. The second experimental group, entering a year later, started at a higher point[7] but showed a similar parabolic pattern.

Some Deviant Cases

There do appear to be some exceptions to the generally downward trend, but on closer inspection these turn out to be faulted by the methodological artifacts which we anticipated.

Regression to the mean. For example, inspection of the gains recorded in the last three rows of the table reveals dramatic increases that appear to endure in the case of two experimental groups. The highest initial gain of 19 IQ points achieved in the Hodges program was still holding its own two years after intervention had been terminated. The next highest initial leap of 16 points, attained in the Weikart program, dropped to 10 points four years after intervention when the children were in the third grade, but it was then the highest achieved in any of the five projects. The spurious nature of these high increases becomes obvious when we recall that these are the only two studies that used initial IQ as a basis for selection of subjects. In short, the gains are inflated by regression to the mean. The extent of the artifact is indicated by the increase recorded for the same period by the corresponding control groups – an initial gain of four points in the Weikart project and from 6 to 9 points in the Hodges study. (The C_1 control group is excluded since these children were exposed to a

[6] There was some evidence of a residual experimental effect in academic achievement, but this was limited to girls.

[7] Probably because of somewhat more favorable family circumstances as reflected in a higher average income and half as many families with absent fathers. (Klaus and Gray 1968, pp. 5-7)

regular kindergarten program.) An unbiased estimate of the accomplishment of the two experimental groups is provided by the difference score in the last column for each project. At the end of second grade, the difference between randomized treated and untreated groups was 5.7 IQ points in the Hodges program, 2.3 points in the Weikart study, both insignificant differences.

Motivational effects. From the viewpoint of stability and durability of experimental effects, the Beller program might seem to be the most effective. There is no problem with regression to the mean, the differences between comparison groups are consistently significant and actually increase somewhat four years after intervention was terminated. The difficulty, of course, is the possibility of motivational bias in favor of the nursery families who were self-selected through their positive response to a written invitation sent out by the schools, and against the children in the third comparison group, whose parents did not enter them in school until the first grade.

To complete the roster of exceptions, the Gray program still shows a significant difference four years after termination between both experimental groups and the distal control group. Unfortunately, this promising finding is confounded by failure to control for differences in motivation to enroll the child in an early intervention program. This effect may be checked by comparing the scores of the randomly selected local vs. the *ad hoc* distal control groups in the Gray (C_1 vs. C_2) and Hodges (C_2 vs. C_3) projects. A comparison of the relevant series of means in Table 2 reveals that in almost every instance, the former are higher than the latter. The trend is evident not only in IQ scores but also in achievement test results. Although the IQ differences in any one year are not significant, it seems probable that the overall discrepancy would turn out to be reliable had it been tested. Moreover, over the full range of seven years encompassed by the Gray project, the difference becomes progressively larger.

All of these facts are in accord with the expectation that failure to control for parents' motivation produces a bias in favor of the experimental group. Although the magnitude of this bias is qualified by the possibility of horizontal diffusion in the local setting,[8] it is unlikely that effects of contagion are powerful enough to explain all of the difference.

[8] Indirect evidence in support of this possibility is cited by Klaus and Gray (1968, pp. 55-59).

In the light of the foregoing analysis accounting for apparent exceptions to the general trend, our original conclusion still stands; namely, *the substantial gains achieved in the first year of group intervention programs tend to wash out once the program is discontinued.*

Relevant Evidence from Other Studies

Additional support for this conclusion comes from four other longitudinal researches which, on one or another ground, failed to meet our criteria for inclusion in the primary comparison group.

Sprigle's "Learning to Learn" Program, enrolling children from low income Black families in Jacksonville, Florida, is still under way. (Sprigle 1972; Van De Riet 1972) One experimental group, which gained 16 points during two years of intervention has now been followed for one year in the public kindergarten. The IQ achieved at this point shows a slight drop, which, taken by itself, justifies no conclusion.

The Di Lorenzo Research. A second study, however, permits extension to the next grade level. In an evaluation of the effects of preschool programs introduced in eight New York State communities, Di Lorenzo (1969) still found significant differences between randomized experimental and control groups through the first grade on tests of academic achievement. (No intelligence tests were included in the follow-up battery.) But in the one community in which follow-up was continued for an additional year because of "notable success,...the significant results achieved by this program, which were sustained through the first grade, were no longer visible at the end of second grade." (Di Lorenzo 1969, p. VII-15)

In addition to providing confirmatory evidence, Di Lorenzo reports data not available from the other studies covered in this analysis which, at first glance, appear to contradict a conclusion reached earlier. In addition to a randomized control group, this investigation included two samples of non-disadvantaged children who were randomly assigned either to the control group or to the experimental classes. In contrast to their disadvantaged classmates, these children were mostly white, and came from middle class families living in residential sections of two suburban communities. The mean family income for this sample was about $12,000 and the average education of parents was two years of college. Under the circumstances, it seems more appropriate, and less cumbersome, to refer to this group as

"advantaged children" rather than merely "non-disadvantaged" as Di Lorenzo does.

In the course of the one-year preschool intervention program, both the advantaged and disadvantaged children showed statistically significant increases in comparison to their respective controls, but in general, the disadvantaged gained more than the advantaged.

Upon first consideration, this finding appears to run counter to Herzog's results and her disheartening conclusion that "the less they have, the less they learn." Here it was those who had more who learned less. The critical factor, of course, is the fact that Herzog's sample was drawn entirely from inner city neighborhoods with a median income of $3,500 and only 25 percent high school graduates. Much of what these children, along with the disadvantaged children in the New York State study, gained from preschool intervention, was already present in the homes of the advantaged children in the Di Lorenzo sample. The latter were starting from a much higher base, an average IQ of 105 compared to 91 for their disadvantaged classmates.

Additional light is shed on this issue by the results of tests of language development administered in the New York State project. Whereas the disadvantaged children in the program showed significant gains in language level compared to their controls, the advantaged children did not. In Di Lorenzo's view,

> This finding seems to confirm the assertion that the home environment of the disadvantaged preschool child is lacking in the opportunity for language development. The language programs offered added nothing to these levels to the non-disadvantaged child's environment that was not present in his home. (Di Lorenzo 1969, p. V-25)

Finally, the Di Lorenzo study presents our first clear evidence on the comparative effectiveness of different types of preschool programs. The curricula employed in the eight communities ranged from the traditional nursery school approach emphasizing free play to kindergarten programs focusing on explicit learning goals. On the basis of a careful analysis, the eight projects were classified along this continuum into three groups: highly structured, moderate, and unstructured, and then compared on measures of intelligence and language development. Most of the significant differences between experimental and control groups were found in the more academic, cognitively oriented programs. This contrast was even more pronounced in the analysis of carry-over effects of the program into kindergarten and first grade. So long as significant differences could be detected they were "attributable to the cognitive rather than the nursery programs." (*Ibid*, p. VIII-15)

Karnes' Curriculum Comparison. Remarkably similar but more differentiated conclusions were reached by Karnes in her comprehensive follow-up study (1969) comparing the effectiveness of three preschool curricula for groups of disadvantaged children. The first was a traditional nursery school emphasizing informal learning. The second employed the Bereiter-Engelmann (1966) approach designed to teach basic rules and logical structures involved in language usage, arithmetic, and reading. The third was a special curriculum developed by Karnes emphasizing verbal interaction as a means to foster understanding of mathematical concepts, language, reading, science, and social studies. For the first two years of the study, two other programs were included – a Montessori preschool focused on sensory-motor development, and a community nursery school similar to the one described above but including both advantaged and disadvantaged children. At the end of the first year of intervention, the results in terms of IQ and other cognitive measures showed clear superiority for Karnes' Direct Verbal program and the Bereiter-Engelmann curriculum, with the other three trailing behind. Karnes explains the relative inferiority of the two nursery groups on the grounds of insufficient cognitive structure. The poor performance of the Montessori group is analyzed in the following terms:

> The failure of the Montessori children to demonstrate appreciable progress seems to invalidate the notion that the level of structure relates to the progress made by the disadvantaged child. The Montessori program provided a high degree of structure in terms of careful planning for the kinds of motor-sensory activity appropriate to development...The Montessori teacher provided a "prepared environment" but did not systematically engage the child in verbalizations or require such verbalization as part of the definition of productive involvement. This failure of the Montessori program resulted, at least during the intervention period, in somewhat regressive language behavior. Structured emphasis on motor-sensory development without similar concern for verbal development programmatically moves in the wrong direction for the disadvantaged child. (Karnes 1969, p. 13)

In the second year of the program, all five groups attended regular kindergarten in the morning. In the afternoon the children in the Karnes and Bereiter-Engelmann treatments continued to receive special training whereas the other groups did not. This difference was reflected in continuing IQ gains for the latter groups and by a decline for the other three. When the children entered first grade, the follow-up was continued for the Karnes, Bereiter-Engelmann, and traditional nursery groups. By the end of the year, the descending IQ curves for all three groups began to converge toward the bottom of the now-familiar parabola, and the differences among them became non-significant. Unfortunately, the absence of an untreated control group precludes comparison with the other studies in our analysis. Karnes' own conclusion is similar to our own.

> The deterioration in language and intellectual functioning which occurred at the termination of intensive programming demonstrates the need for continued intervention. (Karnes 1969, p. 22)

Deutsch's Five Year Intervention Program. The results of continued intervention with an even more deprived group than Karnes' subjects, who lived in depressed neighborhoods of Champaign-Urbana in central Illinois, are reported in a study by Deutsch (1971) carried out with disadvantaged youngsters from urban slums in New York City, including Harlem.

> In general, the families involved in this program live in conditions of economic deprivation; in crowded and unsafe housing; in an area characterized by high drug addiction rates, high crime rates, low employment rates, and inadequate health facilities. (Deutsch, Taleporos and Victor 1972)

The intervention program began when the children were three years of age and continued into the schools until the end of the third grade. Since there was no follow-up after completion of intervention, the study did not permit evaluation of long-term effects and was excluded for that reason. Both initial gains and differences between the randomized experimental and control groups were quite small (7 points) and the means for the experimental group showed the characteristic hairpin turn while the children were still in the program. At the final testing, after the children had been exposed to five years of intervention, the IQ difference between the experimental and randomized control group was a non-significant four points (97 vs. 93).

The Issue of Program Length

Deutsch's results raise two important issues. First, does the length of program bear any positive relation to outcome? Hopefully, a child who has had the benefit of an intervention program for two or three years would gain more and retain the gain longer than one who has participated for one year only. The data of Table 2 are hardly reassuring on this score, at least so far as preschool programs in group setting are concerned. There are four experimental programs which extended for more than a year. If one takes into account that Herzog's subjects continued to receive special treatment for three years after nursery school, including extra teachers and an enriched curriculum, then two of the programs involved at least three years of intervention (Herzog and Gray's E_1) and another two (Weikart and Gray's E_2) had two years. Of these four, only one shows some rise after the initial gain (Herzog), two show essentially no change (Weikart and Gray's E_2) and the third (Gray's E_1), like Deutsch's experimental group, actually declines. It is significant, in the light of our expectations regarding the impact of degree of deprivation on response to intervention, that the Gray and Deutsch samples are the most economically depressed of any included in this analysis.

The hope that longer programs may insure more enduring gains is also disappointed. If one takes as a criterion the difference in gain between experimental and control groups two years after completion, then the 6 point IQ difference produced by one year of intervention in the Hodges study holds its own against the corresponding 7 point discrepancy achieved in two years by Weikart's project and clearly surpasses the 1 point residual remaining after three years (to be sure, mainly during summers) of Gray's program. It is disheartening that the differences are so small when the years are so long!

Is it possible that the absence of any cumulative effect of intervention programs in these studies is a function of their failure to employ the kind of structured curriculum emphasizing verbal interaction that Di Lorenzo, Karnes, and others have shown to be optimal for disadvantaged children? It is significant in this regard that the two projects in this analysis which produced the smallest initial experimental effects (Herzog and Beller) were the only two to employ a traditional nursery school approach with emphasis on free play and informal activities. In contrast, the Weikart and Gray, and Hodges projects, which, in an evaluation by Bissell

(1970), were classified as "structured cognitive programs," were the most effective at the beginning. The fact that they too ultimately showed a declining curve (in Gray's project while intervention was still in progress) suggests that even the best curriculum cannot immunize a disadvantaged child against developmental decline once he is cast back into his old environment.

Group Intervention: Early vs. Late. In Table 2, all of the groups exposed to more than one year of intervention entered the program at three years of age. The question therefore arises whether greater gains might not have been achieved had intervention begun earlier, in the first or second year of life. Data bearing on this issue have been reported from a project directed by Caldwell (Braun and Caldwell 1972) reporting gains in IQ achieved by thirty disadvantaged preschoolers who had entered the program at different ages, beginning with six months. To test for the influence of age at entry, the total sample was divided into two groups, those who had been admitted before the age of three (N=19) and those enrolled after (N=11). Average IQ's for the two groups at the time of admission was 101 and 102 respectively; the scores following intervention were identical, 119, for a gain of 17 and 16 points respectively. Thus Caldwell's results lend further support to the conclusion that neither longer nor earlier exposure to group intervention produces greater effects.

The Effect of School Entry. An increase in IQ following the initial gain did occur, however, in almost every group, treated or untreated. It took place not while intervention was going on but afterwards and was more pronounced in the control than in the experimental groups. We refer to the consistent rise in score after the children first entered school. Of the fifteen treated and untreated groups in Table 2, twelve exhibited this effect. Of the remaining three, one was the experimental group in the Weikart project, which had been exposed to a nighly cognitively-oriented Piaget-type curriculum producing the highest genuine initial gain observed in any group program; the C_2 control group of the Hodges program had already been in a regular kindergarten for a year; and the C_2 sample in the Beller study was a negatively selected group composed of children from families who, for one reason or another, did not enter their children in school until first grade, even though public kindergartens existed in the community.

The explanation for this highly consistent phenomenon, as well as for the exception to the rule, seems almost self-evident. When the disadvantaged child receives additional cognitive stimulation, as he typically does upon entry into school, his capacity to perform on tests of cognitive function is enhanced. This is particularly true for a youngster who is exposed to an educational program for the first time, which is what happens in a control group. The reaction is less pronounced in the experimental groups since they had already had such a broadening experience at the beginning of intervention. The slight drop exhibited by what was probably the most cognitively stimulated of these groups, that in Weikart's program, approximates the reaction of a middle class child, who, like the advantaged children in Di Lorenzo's sample, has already experienced much of what ordinary school has to offer.

But why does this opening up of new horizons for the disadvantaged child fail to have enduring effect? The answer again may lie not within the preschool experience but in the home and its environment, an issue we shall examine when we consider the effectiveness of home-based intervention programs.

The Effectiveness of School-Age Intervention

A second and more consequential issue is also raised by Deutsch's results. If extended into the schools, can experimental programs achieve and maintain the impressive gains produced by intervention at younger ages? At least for kindergarten and first grade, the prospect is a hopeful one. In Table 2, the two projects (Gray and Hodges) operative at the kindergarten level show differences between experimental and control groups which compare favorably with those with younger children both in the same and other programs. Corroborative data come from the Sprigle project which reports high gains and experimental differences in IQ through the first grade. Finally, and most significantly, preliminary results are being reported for the first two years (kindergarten and first grade) of the nation-wide, federally-sponsored Follow-Through program which extends the basic philosophy of Head Start into the primary grades. The program is being carried out at centers scattered over the nation and employing a variety of educational approaches. An evaluation of the relative effectiveness of these different strategies, as well as the overall impact of the program, is being carried out with a national sample of over 3900 children enrolled in Follow-Through classes and a comparison group of over 2000 entering school in kindergarten or first grade.

Some early findings from Follow-Through programs. No data from intelligence tests are available, but preliminary analysis of performance on academic achievement tests (Stanford Research Institute 1971a, 1971b) indicates that Follow-Through children made significantly larger fall-to-spring gains in achievement than did children in the comparison sample. In addition, the analysis examined which children made the most gains and identified three trends, two of them corroborating conclusions already found in other studies. First, since Follow-Through classes included some students above the poverty line, it was possible to compare program efficiency for advantaged vs. disadvantaged children; consistent with Di Lorenzo's findings, larger achievement gains were made by Follow-Through participants in both kindergarten and first grade who were below the OEO poverty line. Second, the children who made the most gains tended to come from programs with more highly structured curricula. Finally, higher gains were made by children who had participated in Head Start prior to enrolling in the Follow-Through program.

Encouraging as these findings are, they must be viewed with some caution. To consider the points in reverse order, the conclusion that children who had been in Head Start did better than those who had not, was apparently based on a simple comparison of the two groups without control for possible differences in family background factors such as education, or interest in furthering the child's development. It is possible, therefore, that the obtained result reflects differences in sample rather than effectiveness of prior intervention. Assuming that the finding will be confirmed in a more refined analysis, one may ask why the effects of group intervention should be cumulative in this instance when they were not in the other studies we have examined. One possible consideration lies in the comprehensive character of both the Head Start and Follow-Through programs; that is, they are concerned not only with providing an educational program, but also meeting the needs of the child and his family in the areas of health and social service. We shall return to a consideration of this point in later discussion.

Which curriculum is best? With respect to the differential impact of various curricula, there can be little doubt that more structured programs are more effective for disadvantaged children at the preschool and primary level. This conclusion has been elegantly confirmed by a recent observational study conducted by Soar (1972) in 151 Follow-Through classrooms for which achievement data were made available from the national study. Soar's principal finding was that "greater amounts of teacher control, structure, focus, and convergence, or lesser amounts of pupil freedom, exploration of ideas, or experimental teaching led to increased pupil cognitive growth, especially in the skill measures." (p.147)

Having established the superiority of cognitively oriented approaches, we must now take cognizance of some of their limitations. First, the criterion of cognitive growth in all the other studies we have examined is performance on objective tests designed for the primary grades. We remind the reader of the stated limitations of such instruments and the functions they measure. Second, there is evidence that highly structured curricula may have some less commendable side-effects outside the sphere of academic achievement. Thus Bissell (1971) in an analysis of results from a national research program evaluating different approaches in Head Start, found that children enrolled in more structured programs were more likely to give passive responses on the Hertzig-Birch (Hertzig *et al.* 1968) measures of coping style. According to Bissell, the results "suggest that the children have learned what a question is and what an appropriate answer is." Such an orientation may be far more adaptive to the kinds of tasks required of the child in the primary grades than to the expectations of intellectual initiative in defining and solving problems encountered in the upper grades.

In the same vein, preliminary results of the Follow-Through analysis indicate that changes in attitude towards school and learning were more likely to occur in the so-called Discovery approaches rather than the Structured Academic, although it was children enrolled in the latter programs who made particularly large gains. Moreover, in the Discovery groups, there was a strong association between positive shifts in attitudes toward school and gains in achievement. No such relation obtained in the Structured Academic approaches. Finally, the Soars have demonstrated that greater amounts of academic growth over the summer were associated with an unstructured individual teaching style during the preceding school year rather than with a structured, direct style. (Soar 1966; Soar and Soar 1969). Given these facts, it no longer follows that the latter orientation should be the strategy of choice in group intervention programs at the preschool or school-age level. Rather one looks to some optimal mix that begins with firm structure but invites discovery in gradually increasing measure.

The effectiveness and long-range potential of Follow-Through. Finally, on the basic issue of the effectiveness of Follow-Through programs, a serious question is introduced by the failure in the analysis to control for differences in background characteristics of families in the Follow-Through and comparison groups. The available information indicates that the median level of education for the former was in the high school range but, for the latter, close to eighth grade. Even if the observed difference remains after appropriate statistical corrections for this bias, there is the possibility of important motivational difference between the two groups, the effect of which we have yet to examine.

But the all-important question is whether the difference will continue to obtain for children enrolled in the Follow-Through program in subsequent grades. It is significant in this regard that, in Table 2, the most substantial drops in IQ both of experimental and control groups occur past the first grade in the Gray project, which we identified as serving the most environmentally deprived families. Similarly, Deutsch's experimental subjects, who appear to have come from a severely depressed and socially disorganized slum, showed a drop in IQ between the first and fourth grade even though the intervention program was still in operation. It has been fashionable to blame the schools for the erosion of competence in disadvantaged children after six years of age. The decline of IQ in Deutsch's experimental subjects, who were enrolled in an innovative and enriched educational program, suggests that the fault lies in substantial degree beyond the doors of the school.

Growth and decline in and out of school. The source of the problem, and its potential solution, are suggested by a series of studies in which familiar data are analyzed in a new, simple, and revealing fashion (Hayes and Grether 1969, Soar 1966, Soar and Soar 1969). Whereas ordinarily investigators assess academic gains by examining changes from fall to spring, these researchers also looked at the remaining interval from spring to fall. In other words, what happens over the summer?

A typical answer appears in Hayes and Grethers' analysis of results on reading achievement tests from several hundred thousand students enrolled in grades II through VI of the New York City school system. Although pupils from various social and ethnic groups start at markedly different levels in the fall, and gain at somewhat different rates during the year, the main difference occurs over the summer. Over the vacation, white pupils from advantaged families continue to gain at about the same rate, whereas those from disadvantaged and Black families not only progress more slowly but actually reverse direction and lose ground, so that by the time they return to school they are considerably farther behind their classmates from more favored circumstances. The authors estimate that "the differential progress made during the four summer months accounts for upwards of 80 percent of differences between the economically advantaged all white schools and the all Black and Puerto Rican ghetto schools" (Hayes and Grether 1969, p. 7).

The authors conclude that "half or more of the differentials in reading and word knowledge are associated with non-school periods." (Ibid. p. 10) It would be a mistake, however, to attribute this 50 percent entirely to extra-curricular factors. For example, we have already noted that greater amounts of academic growth over the summer were associated with an unstructured, rather than direct individual teaching style during the preceding school year (Soar 1966; Soar and Soar 1969). Nevertheless, Hayes and Grether are probably justified in their conclusion that the substantial difference in academic achievement across social class and race found by the end of the sixth grade is not "attributable to what goes on *in* school, most of it comes from what goes on *out* of school." (p. 6) Consistent with this conclusion Coleman (1966) found that very little of the variation in school performance was accounted for by differences associated with the school; the most powerful predictors were background characteristics of the child's family.

The implications of this state of affairs for the design of intervention programs have been eloquently stated by Hayes and Grether.

> If our conclusion is correct, our whole approach to equalizing educational opportunities and achievements may be misdirected. Enormous amounts of money and energy are being given to changing the school and its curriculum, retraining its teachers, and tinkering with its administrative structure – local, city, and state. We may be pouring money and energy into the one place which our results say is not primarily responsible for the. . .differentials that have been measured. (p. 10)

The conclusion serves as an appropriate transition to our examination of the effects of home-based intervention programs. Before doing so, it may be well to forestall what to the reader may now appear as a foregone conclusion; namely, that group intervention pro-

grams in preschool or school settings are, as Hayes and Grether have proposed, misdirected efforts. Our analysis will not lead to such a verdict; rather it will point to strategies that combine elements form both home and preschool programs, conduct operations in each setting, but introduce into each context activities and, above all, people from the other half of the child's world so that he can benefit from the potentially great contribution of both hemispheres.

V. SOME EFFECTS OF HOME-BASED INTERVENTION

The form of Table 3 is the same as that of Table 2, but the substance is happily different. In contrast to group intervention projects, the experimental groups in these home-based programs not only improve on their initial gains but hold up rather well three to four years after intervention has been discontinued. There is some erosion, but the losses are small. The differences between experimental and control groups do decrease after the program is ended, but the decline is due less to a drop in mean for the treatment group than to a rise in the controls. In fact, the phenomenon of what might be called *"the climbing control group"* is universal for the home-based studies of Table 3. Moreover, the effect is much more pronounced than in the single instance in which we have encountered it previously in the Herzog project. Since, in all three cases, we are dealing with untreated subjects, the explanation must be sought not in the nature of intervention but in the characteristics of the sample. What all three projects have in common in this respect is the admission requirement that parents be interested and willing to enroll their child in the program even at risk that he might end up in the control group. Moreover, in the case of the two home-based projects, they had to go a step further and allow a stranger to enter the door. Finally, the most demanding condition was exacted in the Levenstein study, which required the mother to participate in intervention activities both during and in between visits.[9] Appropriately enough, it is this project which exhibits the steepest climbs on the part of untreated subjects.

It seems reasonable to conclude that the climbing control group resulted from the self-selection of families in terms of their motivation to provide educational experience for the child. The more motivation was required, the more selective the sample of parents, and the more likely their children were to make a gain in IQ even if not admitted to the intervention program.

Finally, there is evidence that the self-selection took place not only in terms of attitudes and interests but social characteristics as well. The Levenstein sample has been identified as the least disadvantaged of the seven included in this analysis. For example, the average education of the parents was the highest for any project — eleventh grade, just below the cutting point for admission. This process of psychological and sociological self-selection apparently reached its high point in the C_2 control group, which, as indicated in Table I, turns out to be exceptional even for Levenstein's families. All of the mothers had finished high school, there were no absent fathers, none of the families was on welfare, the size of the family was the smallest, and the weight of the child at birth the highest found in any of the seven sub-samples of the study. The rocket-like ascent of 13 points in IQ[10] exhibited by the children of these self-selected low-income families randomly assigned to a control group contrasts dramatically with the 10 point decline shown by the negatively selected distal controls in the Gray study. When one adds to this comparison the performance of the respective experimental groups in the two projects, the total picture presents striking evidence of the influence of the degree of social (and thereby motivational) deprivation on response to intervention. In this respect, Herzog's verdict appears correct: "The Less They Have, the Less They Learn."

But motivational and social characteristics are not the primary factors that differentiate the home-based programs of Table 3 from the group intervention projects of Table 2. First, and most obviously, the former began working with the child at an earlier age. Second, whereas all the center-based programs involved placing the child for several hours daily in group settings outside the home, the Schaefer and Levenstein projects consisted

[9] It is significant that the attrition in this program was high, but limited to the control group. It seems plausible that these "drop outs" had volunteered in the hope of participating in the program and left when this hope could not be realized.

[10] The gain cannot be attributed to diffusion from an experimental group, since treated and untreated families were located in different communities.

Table 3. Effects on Later Intellectual Development of Home-based Intervention Programs

(Double line designates point at which intervention was terminated.)
(Single broken line designates point of entry into school.)

	Schaefer[a]			Levenstein I[c]					Levenstein II				
	1	2	3	4	5	6	7	8	9	10	11	12	13
	E	C	E-C	E_1	E_2	E_3	C_1	$\overline{E}-C_1$[d]	E_4	E_5	C_2	C_3	$\overline{E}-\overline{C}$
N	24	24		6	7	21	8		8	15	7	10	
Age 1 Before	105.9	109.2	-3.3[b]										
Age 1 After	95.3	89.4	5.9										
Age 2 Before				82.8	82.6	90.1	91.4	-8.7					
Age 2 After	99.6	90.2	9.4	101.8	101.1	101.8	89.8	11.6*					
Age 3 Before									91.1	87.6	91.3	91.0	-3.5
Age 3 After	105.6	89.4	16.2	102.6	105.0	108.6			101.3	102.4	95.8	–	6.4
Age 4 Before													
Age 4 After	99.1	90.1	9.0	98.5	103.6	108.2	85.0	16.0[b]	106.6	–	–	–	–
Kindergarten Before													
Kindergarten After	97.8	92.8	5.0	–	–	107.2	–	–	–	103.8	101.1	–	–
Grade I	100.6	96.9	3.7	98.8	100.6		88.8	10.9[b]	104.5	94.4	104.3	96.3	0
Initial Gain	-10.6	-19.8	9.2	19.0*	18.5*	11.7*	-1.6	20.4*	10.2	14.8*	4.5		8.7[b]
Gain 2 Years After	-8.1	-16.4	8.3	15.7*	21.0*	17.1*	-6.4	24.8[b]	15.5*	–	–	–	–
Overall Gain	-5.3	-12.3	7.0	16.0*	18.0*		-2.6	19.6	13.4[b]	6.8[b]	12.9	5.3	2.2
Achievement Level	.7	.7	0	1.2	1.4		1.2	.1	2.1	1.5	1.6		.2

a. Bayley Infant Scale was used for first three testing periods; Binet thereafter.
b. No significant tests available for this value and rest of column.
c. Cattell Test used at age 2.
d. $\overline{E} = \frac{1}{2}(E_1 + E_2)$.

solely of home visits of an hour or less and emphasized interaction on a one-to-one basis between child and adult. A more detailed analysis of the data and methods of these early intervention studies sheds further light on the specific nature of the critical factors involved.

Schaefer's Infant Education Research Project

The one and one-half year olds entering Schaefer's program, although they were children from disadvantaged families, differ from all other, older entering groups in two respects. First, their initial test scores equal or exceed the norms for the population, as well as the beginning score for all the older age groups. Second, in contrast to the results of all the other intervention programs, Schaefer's experimental group actually showed a drop after the initial intervention period (when the children were almost 2 years old). As Schaefer points out, this pattern is in fact typical for very young children from disadvantaged families and reflects the manner in which an inadequate environment, unless counteracted by intervention, begins to impair the child's development by the second year of life.

> Several studies have found that low socioeconomic groups do not show low mental test scores prior to 18 months of age . . .The somewhat below average scores for the experimental group at 21 months and the increasing scores [while the child remained in the program] . . suggest that their experience prior to 15 months might have adversely influenced mental development but the home tutoring program then stimulated a more rapid rate. (Schaefer 1968, p. 2)

As a result, Schaefer recommends that early intervention programs "should begin before 14 months of age, a conclusion that was supported by the tutors' reports that some of the infants showed signs of early deprivation at the time tutoring began." (Schaefer and Aaronson 1972)

At the same time, the fact remains that the average IQ of the tutored children as well as the difference between experimental and control groups dropped after termination of the program, and, as shown in the last line of Table 2, the treated and untreated subjects were exactly equal in their performance on the Stanford Achievement Test administered at the end of first grade. Indeed, the groups were virtually identical even on each of the four subtests. This erosion of initial effects has prompted Schaefer to further analysis of his data and a re-evaluation of the basic strategy to be employed in early intervention.

Before turning to a consideration of this important reappraisal we call attention to another research confirming Schaefer's negative result and conclusion. Utilizing an ingenious experimental design, Kirk (1969) sought to determine whether a tutoring program carried out with very young children could produce greater gains than those typically achieved with preschool children at later ages. In his study, fifteen infants between one and two years old were exposed to one year of home-based daily tutoring emphasizing eight areas of cognitive development. In comparison with a randomly selected control group, the experimental infants showed a significant increase in IQ of 5 points. At the conclusion of tutoring, the experimental group was enrolled for one year in a Karnes-type preschool program for three year olds and gained an additional 11 points. As we have seen, and as Kirk points out, an initial rise of only five points in IQ is quite small in comparison with the gain typically achieved in group intervention projects. It is even more unusual for intervention to achieve a greater gain in the second year than in the first. On these grounds, Kirk concluded that a tutoring program before the age of two was not as effective as group intervention in the later preschool years. At the same time he emphasized that:

> . . .this experiment does not exclude the possibility of obtaining marked improvement in children when intervention is initiated at home at the age of one or two, if the intervention consists of a program in the home that includes more than one hour of tutoring plus a program of parent training and parent interaction. (Kirk 1969, p. 248)

It is precisely in this same direction that Schaefer was led by the disappointing results of his own program. Having noted that tutoring affected not only the behavior of the child but also of the mother, and that mothers in the experimental group differed appreciably in their reactions both to the child and to the program (Schaefer 1968), Schaefer undertook an analysis of the relation between patterns of mother-child interaction during the tutoring session and the IQ obtained by the child at the end of intervention (Schaefer and Aaronson 1971). The results revealed a cluster of variables that was negatively correlated with mental test achievement at the end of the program (*i.e.* at three years of age) as well as with ratings of the child's task-oriented behavior. The

components in the cluster included such factors as Withdrawal of Relationship, Hostile Detachment, Low Interest in the Child's Education, Low Verbal Expressiveness, and Low Involvement with the Child. On the basis of this analysis, the authors concluded as follows:

> Data from this project have provided additional evidence that maternal positive involvement, interest in the child's education, and verbal expressiveness with the child are related to his early intellectual development. . .the relationship between a mother's acceptance of the child and her educational efforts is paralleled by the relationship between the child's competence and his adjustment. (Schaefer and Aaronson 1972)

This conclusion, in turn, has led Schaefer to question prevailing strategies of early intervention for limited periods in group settings. He called instead for "early and continuing education" which should be "family-centered rather than child-centered."

> Evidence that mean IQ scores increase during intensive intellectual stimulation and decrease after such stimulation is terminated [is] cited as supporting family-centered programs designed to increase adequacy of family education throughout the period of child development. (Schaefer 1970, p. 78)

With respect to the content of such a program during the early years, Schaefer and Aaronson (1972) offer a specific recommendation: "The experience of this project would not support an emphasis upon promoting early sensory-motor development but would support the development of early relationships, interests, and language."

No data bearing directly on the effectiveness of Schaefer's recommendations are available from his own tutoring program, which, as he regretfully points out, was focused on the child rather than the family. Levenstein, however, apparently quite independently, followed precisely the strategy advocated by Schaefer. We shall shortly look to the results of the Levenstein program for evidence on the scientific validity and practical effectiveness of Schaefer's recommendations.

But before doing so, we would warn against premature dismissal of Kirk and Schaefer's tutoring approach. For reasons that are already apparent, programs modeled on this prototype may be able to reach families that are not accessible to strategies of direct parent involvement of the type developed so successfully by Levenstein, even though such strategies may be more effective once the family has agreed to cooperate. Indeed, the use of a tutor may be most appropriate as a transition phase to programs focused on enhancing parent-child interaction of the type we next examine.

Levenstein's Verbal Interaction Project

By and large Levenstein's results lend support to Schaefer's predictions, both negative and positive. On the one hand, the impact of an oppressive environment, not yet evident in Schaefer's younger entrants, is already apparent in Levenstein's two and three year olds. Although the suburban environment from which her subjects come was less deprived than that of Schaefer's infants from the Washington slums, her cases obtained initial IQ's in the 80's and low 90's, comparable to the scores obtained by their mothers, and well below the national norm. Moreover, Levenstein's five experimental groups not only attained this norm following initial intervention but in the case of children entering at age 2, generally maintained a fifteen point or more superiority over controls (and over their own mothers) three to four years after termination of the program. Moreover, the differential performance of the five experimental groups exhibits a consistent pattern. The three groups (E_1 - E_3) that began the program at two years of age showed greater initial and overall gains, but their "head start" was confounded with longer and somewhat more intensive treatment. As indicated in Table 1, each of these groups, after completing the regular program in the first year, also received some kind of intervention during a second year, Group E_3 getting the full treatment, Group E_2 an abbreviated version, and Group E_1 exposure to toys only. Final IQ levels attained by each of these groups vary directly with the intensity of the program received.

Confirmatory evidence that even the weakest of these treatments, exposure to toys alone, has a significant effect is available from the results of a special control group which was employed for one year only and hence was not included in Table 2. This group received the special kit of toys, was visited regularly, but no demonstrations or encouragement were given for mother-child interaction. These children showed a statistically significant rise of 8 points, compared to the typical initial gain of 12 to 19 points recorded in Table 2. Thus the sheer availability of educational materials designed to foster mother-child interaction contributed to a rise in IQ in the first year, but this increase was not so great as that obtained by demonstrating and encouraging use of the materials in the course of mother-child interaction. Finally, the control group, which received

bi-weekly visits but without exposure either to the special kit of materials or encouragement of mother-child interaction, showed comparatively little change.

We turn next to the two groups who entered the program at three years of age. Both groups gained significantly.[11] One of these, E_4 still maintained an impressive IQ level three years after intervention, but the other showed an appreciable loss of 8.6 points over the same period. Reference to Table 1 reveals an important difference in the prior experience of the two groups, E_4 having served as a "placebo" control in the previous year; that is, the family received bi-weekly visits for seven months, although without demonstration and encouragement of mother-child interaction focused around educational materials. It would appear that the provision even of such attenuated support of the mother-child system was not without some cumulative effect.

Viewed as a whole, the results from Levenstein's five differentially treated experimental groups suggest that the earlier and more intensely mother and child were stimulated to engage in communication around a common activity, the greater and more enduring the gain in IQ achieved by the child.

Given the encouraging results of Levenstein's program, both in terms of immediate and longer range effects, it is important to examine more closely the activities which actually took place during the intervention sessions. Who was the home visitor and what did she do?

At the beginning, Levenstein employed trained social case workers in the role of what she called the Toy Demonstrator, but for later experimental groups, the task was carried out by non-professionals, many of them mothers from low income neighborhoods. That the latter turned out to be no less effective than the former is indicated by the performance of the two experimental groups (E_3 and E_4). As can be seen from the series of means for these groups in Table 3, the gains were as large and enduring as any achieved in the course of the program to date.

After the initial experiment (1970a), Toy Demonstrators for subsequent groups were trained in a one month eight-session training workshop led by the former Toy Demonstrators (Levenstein and Levenstein 1971). The training continued, after they had begun their assignment, through weekly conferences in which their work was supervised and orientation given for the particular techniques to be used in each family session.

The nature of the sessions themselves is described by Levenstein as follows:

> Each time (the Toy Demonstrator) brought with him, as gifts for the child, one or two new Verbal Interaction Stimulus Materials (VISM) to "demonstrate" to the child and mother together. The VISM were commercially available toys and books carefully chosen for their verbal, perceptual, conceptual, and motor stimulus properties and were of increasing complexity. The length of each VISM Session was flexible, with a range from 20 to 55 minutes but averaging 32 minutes. During the session the social worker encouraged the mother to exploit the stimulus properties of the materials for verbal interaction. He used principles of positive reinforcement in building a sense of competence in both mother and child and served as a model to the mother in interacting with the child. The VISM were then left with the dyad for daily use of the mother and child together. At each visit the social worker "reviewed" VISM previously assigned and emphasized the importance of mother-child play interaction with verbalization between visits. By the end,. . .each Experimental child had received 23 VISM, [toys and books]. . . the same for each child in approximately the same order. (Levenstein and Sunley 1971, p. 118)

It is obvious that the home visitor did much more than is conveyed by the title of Toy Demonstrator. The reason the visitor was identified by this modest label becomes apparent from the following instructions:

> Treat the mother as a colleague in a joint endeavor in behalf of the child. Share your verbal stimulation techniques with her by demonstrating them in play with her child; then draw her into the play, and take a secondary role as soon as you can while she repeats and elaborates what she has seen you do. Encourage her to play and read with the child between Home Sessions. Keep constantly in mind that the child's primary and continuing educational relationship is with his mother; do all you can to enhance that relationship. . .(Levenstein 1970a, p. 429)

[11] The failure of the three-year old group to show appreciable differences between experimentals and controls is a function of sample bias in the C2 control, which, as we have seen, is not comparable to the other groups in the study.

In the light of the above description, and the systematically varying results obtained with the several experimental and control groups, it should be apparent that Levenstein's approach cannot be equated with the more general types of parent involvement typically employed as a supplement to group intervention programs (see Table 1). The strategy involves a particular kind of experience that is focused in its purpose, sustained, sequential, and highly structured in cognitive, social, and motivational terms. It is instructive to examine each of these aspects in turn.

On the cognitive side, Levenstein's strategy clearly incorporates many of the same elements that were present in the structured curricula of the initially most effective group intervention projects such as those of Weikart, Gray, Karnes, and others. The situation is not one of free play but guided involvement in activities adapted to the development of language and thought.

But it is in the social sphere that Levenstein's method is most distinctive. There are two critical aspects in which it differs from the two other approaches we have examined thus far – intervention in group settings and tutoring in the home. First, Levenstein's strategy has as its target not the child as an individual, but the *mother-child dyad as an interactive system.* Second, the principal and direct agent of intervention becomes not the teacher nor the tutor, but the mother. As a result, intervention is not restricted to the period while the child is at the center or the tutor is in the home. Nor does it terminate at the end of the program, but continues so long as the patterns of joint activity and interaction between mother and child endure.

The above defining properties of the Levenstein approach bear a striking resemblance to the conditions identified, from an examination of an extensive body of research, as most conducive to development in early childhood. Bronfenbrenner (1968a) analyzed data from over 150 studies on the effects of early environmental deprivation and stimulation in animals and humans. The researches included investigations both in natural settings and in laboratory experiments. Two subsequent analyses (Bronfenbrenner 1968b, 1972) focused on the implications of the findings for human development. The principal conclusion, indicated by convergent evidence from different sources, was the following:

> *In the early years of life, the psychological development of the child is enhanced through his involvement in progressively more complex, enduring patterns of reciprocal contingent interaction with persons with whom he has established a mutual and enduring emotional attachment.* (Bronfenbrenner 1972a).

The fact that these same elements played a significant role in Levenstein's program is indicated by the analysis she carried out of observational data collected during home visits. The results revealed that the aspect of maternal behavior most strongly related to the child's gain in IQ was a "verbal interaction cluster" involving "responsiveness to the child, clarity of explanation, expressed approval, and the use of reason." (Levenstein 1972a)

As the foregoing conclusion and findings imply, reciprocal interaction between mother and child involves both cognitive and emotional components which reinforce each other. The special significance of this interplay has been spelled out by Bronfenbrenner in the following three propositions derived from his analysis of the available research evidence.

> *Proposition 1.* Psychological development of particular behavioral capacities in the infant is brought about through the infant's participation in progressively more complex patterns of contingent, reciprocal interaction with the mother (or substitute caretaker).
>
> *Proposition 2.* The infant's participation in progressively more complex patterns of interaction with the mother also has the effect of strengthening his dependency drive toward the mother.
>
> *Proposition 3.* The strengthening of the dependency drive in turn accelerates the infant's psychological development by motivating him to be attentive and responsive to those aspects of the mother's behavior which signal probable satisfaction or frustration of his dependency drive.
>
> (Bronfenbrenner 1968b, p. 252)

In other words, when the pattern of reciprocal interaction takes place in an interpersonal relationship that endures over time (as occurs between mother and child), it leads to the development of a strong emotional attachment which, in turn, increases the motivation of the young child to attend to and learn from the mother. Moreover, Bronfenbrenner's (1968a) survey of the research evidence indicated that the infant's dependency on the mother develops gradually over the first year of life, reaches a maximum in the second year, and then decreases as the young child forms new attachments and interests. This finding implies that a mother-infant intervention program begun before three years of age

would be more effective than one initiated later. Levenstein's results are consistent with this expectation, but, in view of the small number of cases in the older experimental groups (8 and 16) replication is highly desirable.

The type of mother-infant interaction developed in Levenstein's program has yet another consequence for the development of the young child. A follow-up analysis by Bronfenbrenner (1972) of studies published after 1968, highlighted the fact that reciprocal interaction involved not only a two-way process, but also a two-way effect. Particularly during the first two years of life, the mother not only influenced the development of the infant, but the infant influenced the mother, first by attracting her attention and then, over time, by shaping her behavior through the selective reinforcement of quieting, smiling, vocalization, and manipulative behavior. (Bell 1968, Rheingold 1969, Moss 1967) For example, the infant not only imitates the mother beginning as early as six months of age (Gardner and Gardner 1970), but the mother also imitates the behavior of the child, particularly when he begins to vocalize, and this in turn facilitates his development. (Bee *et al.* 1969; Hess, Shipman, Brophy, and Bear 1968, 1969; Moss 1967; Kagan 1968, 1971; Tulkin and Kagan 1970; Tulkin and Cohler, in press) In other words, *the mother not only trains the child, but the child also trains the mother.* Furthermore, as revealed in the Bee, Hess, Kagan, and Tulkin studies, it was precisely in the sphere of responsiveness to the child's acts and verbal interaction with him that mothers from disadvantaged families differed from their middle class counterparts.

These findings illuminate the process through which the Levenstein approach achieves its substantial and persisting increase in the intelligence quotients of children from low income families. The strategy addresses processes not in the child but in the two-person system which sustains and fosters his development. Moreover, since it is the product of mutual adaptation and learning, the system exhibits a distinctive hand-in-glove quality, and thereby an efficiency, that would be difficult to achieve in non-enduring relationships. Finally, since the participants remain together after intervention ceases, the momentum of the system insures some degree of continuity for the future. As a result, the gains achieved through this kind of intervention strategy are more likely to persist than those attained in group preschool programs, which, after they are over, leave no social structure with familiar figures who can continue to reciprocate and reinforce the specific adaptive patterns which the child has learned.

Finally, Levenstein's approach involves motivational factors at still another level. The first of these levels lies, in a sense, beyond the control of the program itself, but nevertheless plays a significant part in its effectiveness. This is the fact already noted that the disadvantaged families who participate are pre-selected in terms of their interest, willingness and ability to take an active part in the intervention process. But there is also a second motivational set which is a product of the way in which the program is designed. It is reflected in the Toy Demonstrator's title, in the auxiliary role in which he presents himself and ultimately functions, and in the primary and even exclusive focus of attention on the mother-child dyad. In most early intervention programs, parent involvement is an adjunct to a group program in a preschool setting. In Levenstein's project, parent involvement stands alone, and it takes place in the home, where, from the point of view of the child, the parent reigns.

In view of the promise of Levenstein's approach, the question arises whether the same results can be obtained by other workers especially with families from more deprived backgrounds, than those found in poverty pockets of Long Island suburbs. Reassuring evidence on this score comes from eighteen replications of her work conducted with a wide variety of low income populations in eight states from New Mexico to Massachusetts. (Levenstein 1972a, 1972b) Of these, eight have completed one year of the program, and four have gone through a second year. In general, the children appear to come from more disadvantaged families than those included in Levenstein's original groups. For example, they include rural white families with an average education of 8 to 9 years, Black children from foster homes in New York City, and an American Indian tribe in extreme poverty and isolation on a New Mexico Indian reservation. Consistent with these more deprived backgrounds, the gains are not as great as those achieved with Levenstein's own samples, but they are still substantial. For example, the four projects that have completed the second year show an overall increase of 15 points in IQ. Regrettably, there are no control groups, and, of course, no follow-up data are as yet available. It therefore remains to be seen whether the gains endure once intervention is terminated, particularly after the children enter school.

A second issue concerns the specific factors that operate to produce the observed changes in cognitive development. Although the pattern of results of the five experimental groups shown in Table 3 sheds some light on this question, the size of each group was typically very small, often only 8 to 10 cases. Hence there is a need for cross validation of these findings. In addition, Levenstein's results suggest an alternative strategy not tested in her own project. Through appropriate experimental variation, she demonstrated that neither a friendly visit nor the provision of instructional materials was sufficient by itself to produce the major effect; the critical element involved inducing interaction between mother and child around a common activity. Additional support for this conclusion comes from Schaefer's project. There the home visitor worked only with the child. Even though the tutor spent five times as many hours per week in the home as Levenstein's Toy Demonstrator, and did so for a much longer period (15 months vs. 7), the results were hardly comparable either in magnitude or durability. Presumably the difference was due to the fact that in the latter program, the mother herself took over the intervention function.

But to achieve this end, is it necessary always to involve both mother and child? Perhaps the same result can be obtained by working mainly with the mother? And if this could be done at the center, with mothers being instructed as a group, the program would be much more economical both in money and time.

Although no follow-up data are as yet available, a series of researches directed by Karnes at the University of Illinois contribute important information bearing on the foregoing issues.

Karnes' Experimental Programs for Disadvantaged Mothers. The studies employ a strategy of intervention which is closely similar to Levenstein's so far as home visits are concerned, but involves new elements that provide an instructive constrast. The series of experiments was initiated following the tutoring project discussed previously (Kirk 1969) in order to determine whether substituting the mother for the tutor would produce more satisfactory results. The first study we shall examine dealt with infants one to two years of age. A sample of families living in an economically depressed neighborhood was drawn from the rolls of the Public Health Department and the Office for Aid to Dependent Children. In addition, "acutely disadvantaged neighborhoods" were canvassed to locate families in need unknown to the referring agencies. From this group, fifteen mothers with infants in the stated age bracket were invited to attend a two-hour class each week in which they would be instructed in teaching techniques to be used with the infant at home. In order to provide for a babysitter, the mothers were paid $1.50 an hour to attend these meetings and transportation was furnished.

> In general, the weekly meetings were divided between child- and mother-centered activities. The first category included the presentation of educational toys and materials with an appropriate teaching model. . .The mother-centered activities involved group discussion directed toward child-rearing problems in today's society but was intended to foster a sense of responsibility in the mothers for themselves, their families, and the community in which they live. (Karnes *et al.* 1969a, p. 251)

Eleven educational toys, designed to create opportunities for verbal development, were demonstrated to the mothers, and books were suggested to encourage language interaction between mother and child. In addition, staff members made at least monthly visits to the home in order "to reinforce the teaching principles introduced at the meetings and to help each mother establish a working relationship with her baby." (Karnes *et al.* 1969a, p. 251) In sum, the approach was very similar to that of Levenstein, but differed in three respects: most of the instruction was carried out with mothers at group meetings, home visits occurred once–or occasionally twice–a month instead of semi-weekly, and the program lasted fifteen months instead of seven.

The original plan called for a comparable control group and follow-up until at least three years of age, but because of termination of funding, these intentions could not be realized. In lieu of a randomized control group, the authors established a comparison group of 15 selected from among over 50 disadvantaged children on whom test results were available. The controls were pair-matched on age, sex, educational level of the mother, welfare status and a variety of other variables. At the end of the program, the experimental group obtained a mean IQ of 106, 16 points higher than the comparison group.

The authors acknowledge that, despite the careful effort to insure comparability, "a conspicuous variable remains uncontrolled. . .the mothers of the experimental children demonstrated a concern for the educational development of their child." (Karnes *et al.* 1970, p. 927)

To check on this possible bias, the researchers compared the IQ's of six experimental subjects to scores obtained by their older siblings when they had been of the same age, which, of course, was prior to the mother's participation in the intervention program. A 28 IQ point difference in favor of the experimental subjects was obtained. Even though the N in the second comparison is small, taken together the two results present impressive evidence for program effectiveness.

In this same study, Karnes and her colleagues also sought to discover whether any factors in the background of the child influenced his capacity to profit from this form of intervention. Although the number of cases was small, one contrast was so pronounced as to merit serious consideration. In the experimental group, there were six mothers who worked full-time. Both in terms of mental test scores and measures of performance in program activities, their children "uniformly fell below. . .the children of mothers who were not em yed on a full-time basis outside the home." (p. 260) Correspondingly, differences were evident in the behavior of the two groups of mothers. Not only did the full-time working mothers show "markedly poorer" attendance at the weekly group meetings but they also received the lowest ratings on quality of mother-child interaction observed during home visits.[12]

Taking into account the consistently inferior pattern of response exhibited by both mother and child among families with working mothers, the authors state:

> It seems fair to conclude that, in spite of verbal support of the program, the six mothers who were fully employed did not have the time or energy to implement program goals. . .
>
> In general, mothers employed on a full-time basis outside the home cannot effectively participate, and their children may be better served through day-care placement. (pp. 260-261)

Several caveats appear to be in order with respect to this conclusion. First, it is based on a small number of cases. Second, in comparison with a sample such as Levenstein's, the families come from more depressed neighborhoods, and have a higher proportion of absent fathers (about 83 percent). In a less disadvantaged group, like Levenstein's, the disruptive effect of full-time work may not be as great. Unfortunately, Levenstein's data are not broken down by full-time vs. part-time employment, a distinction which would appear to be critical in terms of the mother's availability to the child. Finally, the results were restricted only to the immediate effects of intervention; it is conceivable that a follow-up study would reveal residual benefits even for children of mothers who work full-time. Nevertheless, the findings set serious qualifications on the effectiveness of this form of intervention with infants under two years of age when the mother is employed on a full-time basis.

Another study by Karnes and her colleagues (1968, 1969b) demonstrates that the same strategy is effective with four-year-old children, although in reduced degree. As before, mothers living in economically depressed neighborhoods attended weekly two-hour instructional meetings, and in addition the teachers visited the home at two-week intervals to demonstrate teaching techniques. The program lasted twelve weeks and produced a significant mean gain of seven points compared to no difference for a carefully matched control group drawn from the same sample of families.

The investigators identify four factors as contributing to the positive results of the program.

> First, mothers were paid for attending the meetings and were fully recognized as important members of the intellectual team. Second, as opposed to a lecture approach, the mothers were actively involved in developing materials to be used during the week with their children. The training situation was not threatening and provided opportunity for a positive relationship with school authority figures. Third, the teachers visited in homes. . .Fourth, because the mothers had made many of the instructional materials and understood their use, they could approach the teaching of their children with confidence. They could readily observe the progress of their children and were immediately rewarded for their maternal efforts. (Karnes *et al.* 1968, pp. 182-183)

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[12] Lower attendance, motivation and teacher effectiveness were also observed among the mothers of the younger infants under 18 months. No corresponding difference was perceptible, however, in the mental development of their children, who obtained the highest post-Binet scores of any sub-group in the sample. It is possible that the inferior response of the mothers was a function of weaker feedback from the younger infant in terms of what are ordinarily looked for as signs of maturity in a young child (e.g. talking). If so, this phenomenon could be taken into account by alerting the mothers to the signs of development in very young children.

These four factors once again underscore the importance of enabling the parent to function as the primary agent of intervention and to receive recognition in that role.

At the same time, the seven-point increase attained by these four-year-olds is considerably lower than the typical gain achieved with younger children both by Levenstein and Karnes. The poorer performance is probably accounted for both by the fact that the program was shorter - only seven weeks - and the children two to three years older.

Since Karnes' mother-intervention program contains all of the elements of Levenstein's approach, it represents an independent development confirming the effectiveness of the general strategy, in this instance for families somewhat more disadvantaged than the samples with whom Levenstein worked. In addition, the Illinois studies demonstrate that similar effects can be obtained, at least initially, with less frequent home visits. This does not mean, however, that fewer home visits can accomplish the same result, for the Karnes experiment involved several compensating features. First, the experimental difference of 16 points in IQ in Karnes' infant studies was obtained after fifteen months of intervention, compared with the seven months typical for the youngest age group in Levenstein's program. Second, Karnes introduced an additional motivational factor by having the mothers meet in a group which could provide mutual reinforcement and a source of security. Indeed, it is possible that the prospect of going out to such a group for instruction was less forbidding than being taught by a stranger alone in one's own home, and this factor could have contributed to the acceptability of the program to a more deprived group than that reached by Levenstein.

An additional experiment by the Karnes group (1969c), however, indicates that motivational factors at the group level operate in an even more complex way than that envisioned in the foregoing paragraph. Encouraged by the results of the mother-intervention program the researchers sought to get the best of both worlds by combining it with a preschool program for the children themselves. For this purpose, the mothers' program was added for a group of disadvantaged four-year-olds entering the Karnes preschool at age four. The mother-involvement segment was conducted along the lines previously described. The three teachers who conducted the meetings for mothers also taught their children, and "made a major effort to coordinate the teaching efforts at home with those at school." (p.205)

IQ gains achieved over a two-year period were compared with those obtained in other similarly selected preschool classes whose mothers did not participate in a special program. Given the positive results attained previously with children of the same age by a program of mother-intervention only, the results of the combined strategy came as a disappointing surprise. The 14 point gain in IQ made by the control group of children in preschool only was actually larger than the 12 point rise achieved by the experimental group, but the difference was non-significant. The control group did score reliably higher in tests of language development.

Why did the mother-intervention program fail to make any added contribution? In the judgment of the original investigators, the explanation lies in a constellation of factors connected with the amalgamation of the mother-child program with that of the preschool. The crucial change was a marked reduction in the number of at-home visits. The authors' account of this change and its motivational consequences is illuminating.

> The mother-involvement program necessarily required expansion from twelve weeks to seven months and specific accommodations since the children now received instruction at school as well as at home. In retrospect, accommodations which seemed appropriate at the time may have inhibited the performance of this group. In the earlier, short-term program the teachers delivered materials to mothers who had been absent and also made home visits at two-week intervals to evaluate the appropriateness of the activities by observing mother and child at work, to demonstrate teaching techniques, and to assess the extent to which mothers were working with their children. When the program was extended, these visits were abandoned. Teachers continued to deliver materials each week to mothers who had been absent and made the three home visits required of all teachers during the seven-month ameliorative preschool. The weekly checklist used by each mother in the short-term study to record the time spent daily working with her child on the various teaching assignments (reading aloud, finger plays, games, counting, etc.) was also discontinued in the longer study. Since the preschool and the mother-involvement program were conducted by the same staff

members, it was assumed that these teachers without the weekly checklist and the biweekly home visit would be able to evaluate the appropriateness of the activities used in at-home instruction and the effectiveness and regularity of the instruction by mothers through monitoring the child's performance at school, especially since the activities designed for at-home use closely correlated with the classroom program.

These changes, which seemed relatively minor at the time, coupled with the child's preschool attendance may have significantly altered the mother's perception of her role in this program. In the short-term study, the mother was aware that she was the only active agent for change in her child, and as she became convinced of the merit of the program, she increasingly felt this responsibility. The fact that project staff placed a similar value on her role was demonstrated to the mother by the weekly checklist and the biweekly home visits to evaluate her work. In the longer study, mothers appreciated the value of the activities for their children but may have over-emphasized the role of the preschool in achieving the goals of the program. Teachers, through their actions rather than direct statement, may have unwittingly reinforced this devaluation of mother-child interaction by making the purpose of home visits the delivery of materials to absentee mothers. The emphasis of home visits had changed from concern over mother-child interaction to concern over the presence of materials, and it was not unreasonable for some mothers to feel that the materials themselves were the essential ingredient in effecting change. Through the weekly checklist the *mother* had reported what she taught *at home*, but during the three visits made in conjunction with the operation of the preschool, the *teacher* reported on the progress of the child *at school*.

Mothers in the short-term study saw the major intent of the program to be the benefits which fell to their children. In the longer study, since the children also received the benefits of a preschool experience, the mothers tended to use the mother-involvement program to meet personal needs. Instead of a mother's program *for children*, the program may have been seen as a mother's program *for mothers*. Evaluations of the longer program, both verbal and written from teachers and mothers, support this view. Mothers frequently commented on their enjoyment of the social aspects of the program and on the genuine pleasure they experienced in making educational materials for their children, but a disturbing number of mothers also indicated at the end of the year that the primary use of these materials at home was by the child alone or under the direction of older siblings. Apparently mothers felt that they had fulfilled their responsibility to the program when they sent their children to school, attended a weekly meeting, and made educational materials, and, indeed, this level of involvement represented a major commitment. To some extent, mothers may have substituted these experiences for direct mother-child interaction, a consequence counter to the intent of the study, and that substitution may have been detrimental to the development of verbal expressive abilities. The solitary involvement of a child with the materials or their use with a sibling not trained to encourage verbal responses is consistent with such a performance. (Karnes 1969c, pp. 211-212)

Additional evidence consistent with the authors' interpretation comes from the attendance record of mothers at the weekly meetings. Although, as before, the child's admission into the program was contingent upon the mother's willingness to participate in the meetings, in the joint treatment group only half the mothers were present at any one meeting and "one-fourth essentially did not participate in the program."

The results of Karnes' "combined strategy" experiment provide further support for the central principle that emerged from Bronfenbrenner's analysis of research studies and characterized the most successful experimental groups in the Levenstein and Karnes mother-intervention projects; to repeat, *the psychological development of the young child is enhanced through his involvement in progressively more complex, enduring patterns of reciprocal, contingent interaction with persons with whom he has established a mutual and enduring emotional attachment.* Ordinarily such persons are the child's parents or other members of his immediate family. The research results suggest further that *any force or circumstance which interferes with the formation, maintenance, status or continuing development of the parent-child system in turn jeopardizes the development of the child.* Such destructive forces may be of two kinds. The first and most damaging are externally

imposed constraints, such as inadequate health care, poor housing, lack of education, low income, and, under certain circumstances, the necessity for full-time work, which prevent the mother from doing what she might be quite willing to do given the opportunity and the knowledge. Second, there are social forces and educational arrangements that diminish the status and motivation of parents (both mothers and fathers) as the most powerful potential agents for the development of their child. By communicating to the parent that someone else can do it better, that he or she is only an assistant to the expert who is not only more competent but actually does the job, some social agencies, schools, and even intervention programs undermine the principal system that not only stimulates the child's development but can sustain it through the period of childhood and adolescence. Where this system has been crippled by external circumstances, as occurs for millions of families in our nation, there is no adequate support for such learning as the child achieves in school with the result that he loses ground, especially over the summer.

Indeed, given the circumstances, it is somewhat astounding that the minimal change in the environment represented by a home visitor working with mother and child together once or twice a week is enough to bring the mother-child system to an effective level of function that endures beyond the period of intervention. As we shall see, however, parent intervention programs are not, by themselves, sufficient to provide for the child's development, especially as he grows older. Other approaches, including group programs, turn out to play an important role.

Parent Involvement in Group Intervention Studies

Even when the home visitor meets weekly with mother and child together, the gratifying results achieved by Levenstein and Karnes are not likely to occur without the explicit and sustained focus on the development of verbal interaction around cognitively challenging tasks found in these two projects.

Evidence for this negative conclusion has already been before us in the data of Table 1 and 2. Reference to the former reveals that two of the group intervention projects, Weikart's and Gray's, included weekly home visits (of 45 and 90 minutes duration respectively) as an integral part of the experimental program. As with Levenstein and Karnes, the main purpose of the home visit was education to demonstrate instructional materials and approaches and to encourage the mother to adopt these materials and modes of response in working with her child. Yet, as we have seen, neither of these programs achieved the immediate or, especially, the longer range experimental effects produced in Levenstein's project. To be sure, in both the Gray and Weikart studies, the home visits were an adjunct to a preschool program which was clearly viewed as the principal vehicle of intervention. From this point of view, the erosion of initial gains in the two programs provides corroborative evidence for Karnes' conclusion that combining the two strategies, especially where it shifts attention, responsibility, and status away from the parent as the primary agent of intervention, can undermine the potential effectiveness of the parent phase of the program. The result, if our analysis is correct, is to impair the capacity of the program to create lasting effects. The diminution of parental status and responsibility may have been somewhat greater in the Weikart project, since apparently there the home visitor's role was explicitly structured as that of expert and tutor, although the parents' contribution was also recognized.

> Home visits are conducted with two objectives: to individualize instruction through a tutorial relationship with the student and to make parents knowledgeable about the educative process so that, as part of their everyday life, they will foster their children's cognitive growth. To achieve this end, mothers are encouraged to observe and participate in as many teaching activities as possible during the home visits. (Weikart 1967, p. 106)

The role of tutor to the child was neither explicit nor even particularly salient in the Gray project. Principal emphasis appears to have been placed on maintaining

> an active liaison between home and school . . . In addition to explaining the school activities to the parents, the home visitor also suggested some things the parent might not do in response to the children's communications about activities in school . . .The home visitor emphasized to the parents the importance of making an interested, encouraging, and reinforcing response to the reports and materials the children brought from school. (Klaus and Gray 1968, p. 20)

It is clear from the foregoing accounts that, in addition to being secondary to the preschool program, the at-home parent involvement components of the

Weikart and Gray projects did not incorporate the strong emphasis on the importance of the mother and her sustained verbal interaction with her child in relation to a challenging common task. Under these circumstances, it is not surprising that the home-based components in these programs did not insure the larger and longer-lasting gains achieved in Levenstein's project.

The independent contribution of parent involvement. Confirmation for the foregoing conclusions comes from a study conducted by Gilmer *et al.* (1970). The objective was to assess the effectiveness of mother-intervention conducted both jointly with and separately from the regular preschool curriculum in Gray's program. The research involved three different experimental treatments. In the so-called Maximum Impact Group, both the mother and the target child in the family came to the center for training sessions. The child received the regular preschool curriculum of the Gray program five days a week. The mother came once a week to participate in

> a sequential process of skill development and movement from directed observations to actual classroom participation in a teaching role. At a later point in the program a home-visiting teacher called at the home to stimulate use of the mother's newly learned skills in the training program. Continual reinforcement was provided in small group meetings, where the mothers shared successes with their peers. (Gilmer *et al.* 1970, pp. 6-7)

In the second treatment, the target child of the family attended the same preschool, but no program was provided for the mother. These children were designated the Curriculum Group.

A third experimental group had no direct contact with the center but were visited weekly in the home by a staff member "who worked directly with the mothers and used the child to demonstrate the techniques and procedures consistent with the classroom programs." (Gilmer *et al.* 1970, p. 7)

The families in the study were drawn from a Black population living in a large housing project. Since the project was one of the better ones in the city, "its inhabitants would only be considered moderately disadvantaged." (*Ibid*, p. 5). The average IQ of the mother was 82. For reasons to be indicated, all families had to have at least two children of preschool age, with the younger sibling being at least 18 months of age. "A further restriction was the availability and willingness of the mother to spend one-half day a week working in the project. Because of these restrictions, there was some difficulty in constituting groups." *(Ibid*, p. 5)

The older of the two siblings was designated as the target child, and these children were assigned at random to the three experimental treatments with 15 to 19 subjects in each. The investigators report that "some non-random choices were necessary, however, because of differences in the availability of mothers." (*Ibid*, p. 7). In this writer's judgment the nature of the bias thus introduced is reflected in two distinguishing characteristics of the Home Visitor sample. This group ended up with children one year older than those attending preschool; that is, they were five years old compared to three or four. In addition, their mean IQ at the beginning of the study was 6 points lower than for the other two experimental groups (84 vs. 90). Both of these differences are relevant to the interpretation of results.

The two comparison groups for the target sample (with 13 subjects in each) were children from the same housing project enrolled in local preschool programs. A determined effort was made to match groups on demographic characteristics, but no data are provided to indicate the success of the attempt.

Intervention was carried out for a two year period for the two groups enrolled in preschool, and one year for the Home Visitor Group, with a one year follow-up for the former and two for the latter. The results reveal a 16 point initial gain for the Curriculum Group, 11 points for Maximum Impact, and only 4 points for the Home Visitor Group. Each increase was statistically significant, with the first two being reliably larger than the third. All three groups showed a decline after the first year of intervention, but the loss is a non-significant 3 to 4 points for the two groups exposed to parent involvement as compared to a reliable 10 point decrease for the Curriculum Group, with most of the drop occurring in the year following termination of the program.

These results are in accord with several generalizations that have emerged from our analysis. Thus the failure of the Maximum Impact Treatment to surpass the Curriculum Group constitutes a replication of Karnes' finding that parent intervention, when combined with and made secondary to a preschool program for the child, is not likely to produce large gains.

The poor performance of the Home Visitor Group in comparison with the other two, or with the results of programs for mothers conducted by Levenstein and Karnes, appears to be a function of three factors which

are confounded in the present instance, but one of which can be assessed independently on the basis of results from the second phase of the Gilmer study to be discussed below. First, the intervention lasted for only one year, as compared with two years for both of the groups attending preschool. Second, the low gains could have resulted in part from negative selection of the sample in terms of IQ and related characteristics. Third, the poor performance is also consistent with the inverse relation previously observed between the age of the child and the effectiveness of parent intervention. The highest and most enduring gains were obtained with two-year-olds (Levenstein and Karnes). Then in ascending order of age but decreasing experimental effect came three-year-old children (Levenstein), four-year-olds (Karnes), and now youngsters at five, for whom the impact was almost negligible. It is important to recognize that the inverse relation applies to the age of the child at which parent intervention is not merely being conducted but is being initiated for the first time. Finally, the failure of the children in the Home Visitor Group to make substantial gains could be a function in part of the less concentrated parent intervention program, which clearly did not match the intensity of Levenstein's or Karnes' effort to induce verbal interaction between mother and child around a challenging task, or their emphasis on the importance of the parent as the primary agent of intervention.

At the same time, the failure in Gilmer's project of parent intervention to contribute substantially to initial gains should not becloud its significant impact on the "staying power" of the positive changes that were achieved. The Curriculum Group, though it achieved the highest initial gains of 16 points in IQ, lost 10 of these points over the next two years, including one year while the program was still in operation. In sharp contrast, both of the experimental groups exposed to parental involvement decreased only three to four points over the same period. Moreover, contrary to both the other groups, the Home Visitor sample was not receiving any intervention during the second year when it showed its four point drop, and actually made up three of these points in the following year. *In other words, although parent intervention does not achieve as high gains in the later preschool period, it appears to retain its power to sustain increases attained by whatever means, including group programs in preschool settings.* To use a chemical analogy, parent intervention functions as a kind of *fixative*, which stabilizes effects produced by other processes. From a psychological perspective, the phenomenon adds weight to our conclusion that *a home-based program is effective to the extent that the target of intervention is neither the child nor the parent, but the parent-child system.* From the point of view of human development generally, and early intervention in particular, this system is especially important in two respects. First, particularly during the first three years of life, it is the major source of the forces affecting both the rate and stability of the child's development. Second, at least through the preschool years, the system retains its power to sustain and give momentum to whatever development the child achieves within or outside the family setting. It is as if the child himself had no way of internalizing the processes which foster his growth, whereas the parent-child system does possess this capacity. If so, this fact has obvious and important implications for the design of intervention programs, at least for children in the first five years of life. It remains to be seen whether the family continues to exhibit this sustaining power after the child enters school. But first we must take note of the primary contribution of the research by Gilmer and her colleagues.

The impact of vertical diffusion. In addition to supporting and extending generalizations previously reached, the Gilmer study adds some new information on an important fringe benefit of parent intervention. In their longitudinal study, (Klaus and Gray 1968, 1970) had reported significant differences in the third through fifth year favoring not only the experimental subjects, but also their younger siblings as compared with the younger sibs of both control groups. Most of this variance was being carried by the younger siblings closer in age to the target-age children. Gray referred to this effect as "vertical diffusion." The Gilmer study sought to analyze the phenomenon systematically and it was for this reason that the sample was restricted to families consisting of at least two children of preschool age. The investigators analyzed the progression of IQ scores not only for the target subjects but also for their younger siblings in each of the experimental groups as well as in the control group.

Consistent with the authors' hypothesis, the younger siblings whose mothers had participated in the intervention program, whether in the Maximum Impact or Home Visitor Group, obtained higher IQ's both during and after the program than the younger brothers and sisters of children either in the Curriculum or Control Group. Scores in the latter two groups were virtually

identical. Although further replication is needed, these results not only provide clear evidence of vertical diffusion within the family but point to still another advantage of parent intervention programs as against those focused primarily on children in group settings: in the former the benefits extend to the younger siblings; in the latter such effects appear to be negligible.

One additional feature of the results merits attention since it resolves one of the ambiguities noted in discussion of the initial phase of the Gilmer study. The younger siblings in the Maximum Impact Group understandably did not obtain as high scores as their older brothers and sisters who were the actual targets of intervention. But, in the Home Visitor Group, the relationship was actually reversed: although the home intervention was directed at the older child, it was the younger child who made the higher score – a difference of 8 points (no significance test is given). The gap widened even further when, in the second year of the study, the target children of the Home Visitor program, who were then six years old, entered school, and the focus of the home intervention was shifted to the younger child. By the end of the year, the average IQ for the younger sibs was 11 points higher than the level that had been achieved by their older brothers and sisters also after one year of exposure to the same program – 99 compared to 88.

Why should one group of children fail to profit from home-based intervention while their younger brothers and sisters, brought up in the same family, showed gains not only during the program but even before it began, as a function of vertical diffusion?

The resolution of the paradox is found in a simple fact: the younger siblings were of course younger than their older brothers and sisters who served as the original Home Visitor Group. This latter group, it will be remembered, were five years old when the program began. Their siblings, at the start of intervention, were one to three years younger. With family background and mode of intervention held constant, the eleven-point difference in IQ testifies to the importance of initiating parent intervention in the first three years of life while the dependency drive is at its height and the mother has not yet developed firmly established patterns of response, or lack thereof, in relation to the child in question. From this point of view, the earlier parent intervention is begun, the greater the benefit to the child.

The Strengths and Limitations of Family-Centered Intervention

We are now in a position to weigh the pro's and con's of an intervention strategy for mother and child built on the Levenstein-Karnes model. The strengths of the approach are clearly impressive both in terms of productiveness, permanence, and practicality. On the first count, this form of family-centered intervention, when applied in the first three years of life, produces initial gains which are as great as or greater than those obtained either through group programs in preschool settings or tutoring conducted in the home. More significantly, even when parent intervention is introduced after three years of age, the gains are substantially more resistant to erosion after formal intervention is discontinued. This indicates that at least some of the forces enhancing and sustaining the child's development have been incorporated into his enduring environment in the home.

Again in contrast to group programs for children, the family-centered approach benefits not only the target child, but also his younger siblings, although how far down the age line vertical diffusion penetrates beyond the next youngest child remains to be investigated. There is also the possibility that if influence extends to other children in the family, it may affect other adults as well. *Indeed, the power of this strategy, and its practical utility may be considerably enhanced by involving in the training sessions not only the mother but also the father and other adult members of the family.*[13] It is a reflection of the narrow view our society holds of the nature and status of the paternal role, particularly in relation to young children, that the father has not been considered as an important target of intervention efforts, although his actual and potential effect on the development of the child may be as great or greater than the mother's. (Bronfenbrenner 1961, 1972a)

But parents not only serve as the agents of intervention in this approach; they are themselves affected,

[13] On the question of whether other adults from depressed neighborhoods, would be willing to participate, the following observation by Karnes *et al.* is *a propos:* "As a matter of fact, teachers reported that parents, relatives, siblings, and even neighbors sometimes assembled for the teachers' visits." (1968, p. 182)

even in spheres of activity lying outside the parental role. For example, there is evidence that participation in the program for the sake of her child brings important fringe benefits for the development of the mother. Witness the following account by the Karnes group of by-products of their mother-child intervention program for young infants.

> The confidence and capabilities demonstrated by the mothers within the program were reflected in increased community involvement. Four mothers assumed responsibility in the summer recruitment of Head Start children, and one was hired as an assistant teacher and promoted later to the position of head teacher. Two mothers spoke of their experiences in the mother training program at a Head Start parent meeting. Finally, total group involvement was demonstrated at a local Economic Opportunity Council meeting called to discuss the possibility of establishing a parent-child center in the community. Twelve of the 15 mothers attended this meeting and were, in fact, the only persons indigenous to the neighborhood in attendance. (Karnes *et al.* 1970, pp. 931-932)

A similar effect is reported by Gilmer and her co-workers.

> Not reported in the results section is a careful study that was made of the changes in life style of the mothers in the treatment groups. . . . To the extent that one may attribute the life style changes to the involvement of the mothers in the program, we have here some of the most interesting results of the study. These findings, however, should certainly be interpreted with caution because, over a period of two and one half years in the late 1960's, many social changes were taking place.
>
> Still we find that many of the mothers went on to finish their high school education and enrolled in training courses to upgrade vocational skills. Several have taken positions in preschool and day care centers. Five of the mothers at one time were functioning as home visiting teachers themselves.
>
> Interest and participation in community affairs broadened. Social contacts with other members of the community increased markedly. There were cooperative outings, a rotating book library, and the establishment of a bowling league which included fathers. One somewhat ironic effect of the program, from the standpoint of maintaining statistical control, was the wish of many of the parents to move out of the housing project to more improved housing. There were increases in the number of checking and savings accounts, which almost none of the parents had before the study began.
>
> These changes in life style would seem to be the result of the development of environmental mastery, which may be expected to have a supporting effect on the children's continued development. (Gilmer *et al.* 1970, pp. 47-48)

Finally, the parent intervention approach has practical advantages as well. It is clearly more economical, both of time and money, than daily tutoring of the type carried out in the Schaefer and Kirk projects. As for group preschool programs, Gilmer and her coworkers estimated that weekly visits in their home-based treatment cost "only about one-fifth that [for] the Maximum Impact Group." (1970, pp. 17-18) Even when one takes into account the fact that the latter program also involved bringing mothers weekly to the center plus periodic home visits, and that Levenstein's program required two home visits per week, the advantages in terms of cost-effectiveness are substantial. Moreover, it appears likely that Karnes' practice of conducting group meetings for mothers can reduce the number of home visits necessary to maintain the level of growth achieved in Levenstein's project. What the optimal ratio between home and center visits may be remains to be investigated.

In sum, the psychological and practical advantages of the family-centered approach to early intervention clearly offer great promise for the future.

But effective as this strategy is, it cannot work miracles. Nor is it the sole, sufficient, or even feasible solution for many disadvantaged families whose children could profit from early intervention. In many homes, the conditions of life are so harsh that, so long as they persist, the parent has neither the will nor the capacity to participate in educational activities with the child. Under these circumstances, any realistic strategy of intervention must begin by meeting the family's basic needs for survival. We shall address this fundamental problem in due course. But first we must take account of shortcomings inherent in the parent intervention method itself. Even when the parent is willing and able to cooperate, the strategy is limited in what it can achieve. For example, although the erosion of IQ gains after Levenstein's program ended was much less than in other projects, it was nevertheless present. Indeed, in

terms of reading achievement at the end of first grade (see bottom line of Table 3), the difference between experimental and control groups was both non-significant and considerably smaller than the corresponding values for group intervention programs. It is clear that the substantial gains and differences in IQ produced by the Levenstein program were not reflected in the children's performance in first grade as measured by a standardized test of reading proficiency.[14]

And even the marked differences in IQ obtained in the Levenstein program are subject to important qualification. Although the infants were followed for two to four years after completion of intervention, they were still very young at the time of the last testing, two to three years younger than the children assessed in Grades III and IV of the Weikart and Gray studies. In other words, Levenstein's subjects have not yet reached the ages at which the effects of what Deutsch and his colleagues (1971) have called cumulative deficit become most apparent: Once they do so, it seems quite likely that, as with the graduates of group programs, IQ levels will begin to drop, albeit more slowly, and the differences between experimental and control groups will gradually disappear.

But are not such losses readily avoided simply by continuing the parent intervention program? After all, it was only after the home visits were terminated that the typical 15 points IQ gain achieved in Levenstein's project began to erode. Had the visits been continued until the children entered school, would not all have been well? Perhaps so. We cannot know for sure until we try it, but there are some ominous signs. One is the failure of achievement test results to parallel the substantial differences in IQ still evident for Levenstein's subjects when they entered first grade. The disparity suggests that parent intervention alone may not be sufficient to enable the disadvantaged child to hold his own in school. But what if home visits are continued through the preschool years and are accompanied by a group intervention program to prepare the child for learning in a classroom setting? This is what was done, of course, in both the Gray and Weikart projects, and, after only one year in school, the scores of the experimental group began to descend, and the experimental effects to dwindle. To be sure, the parent intervention program was not as focused or sustained as that employed by Levenstein or Karnes. Perhaps more importantly, as indicated by the work of both Karnes and Gilmer, the potential of the program to enhance the child's development was attenuated by combining parent intervention with children's preschool.

We thus find ourselves on the horns of a dilemma. On the one hand, parent intervention alone, with all its benefits, may have limited capacity to prepare the child for learning skills and subject matter in a school setting. On the other hand, preschool intervention alone, with all its benefits, appears to have limited capacity to sustain gains once intervention is discontinued either permanently, or temporarily during vacations or over the summer. Conversely, each strategy possesses the advantages that the other lacks. Parent intervention can sustain developmental gains; preschool programs produce larger increments in the years just preceding school entry and can provide a cognitively structured curriculum more closely attuned to the child's future educational experience. Yet the obvious answer of combining the two approaches apparently entails a risk of reducing the power of parent intervention to enhance the child's cognitive development, at least as measured by IQ.

VI. A SEQUENTIAL STRATEGY FOR EARLY INTERVENTION

Once the dilemma is defined, it points to its own resolution. When Karnes and Gilmer found that attaching a parent intervention component to a children's preschool undermined the effectiveness of the former, they were working with four-year-olds who were entering both programs for the first time. It is an open question, therefore, whether this debilitating effect of combining parent intervention with preschool would

[14] That early parent intervention did have some later impact in the school setting, however, is indicated by two other types of data collected by Levenstein. Of all children in experimental groups, only two – or fewer than 5 percent – were not promoted to the next grade level; among the controls, the rate was three times as high – 16 percent. Also, children in the program were rated more favorably by their teachers than were the controls. One cannot rule out the possibility, however, that the teachers were influenced by knowledge, acquired from the mothers or the children themselves, that the family had participated in the intervention program.

have occurred had these same four-year-olds been involved in a family intervention program since early infancy, two to three years prior to entering preschool. Moreover, we also know that, unlike group intervention, parent-centered efforts are more effective the earlier they are begun. Taken together, these facts point to *a phased sequence* in which family-centered intervention is begun when the child is one or two years old and continues to be the primary focus of activity during the early years. Preschool components are not introduced until later, are offered at first only on a reduced basis, but are gradually extended as the child approaches school age.[15] Throughout, however, in keeping with the principal lesson emerging from our analysis, the family is clearly identified and encouraged to function as the primary agent of intervention for the child.

The Gordon Project. A program involving such a phased sequence is currently being conducted by Gordon (1971, 1972, 1973) with indigent families from twelve Florida counties. A weekly home visit is being conducted for the first two years of life, with a small group setting being added in the third year. About 175 children were randomly distributed into eight groups, systematically varied with respect to age at entry and length of exposure to the program, with one group receiving no treatment whatsoever.

Although no measures of intellectual level were obtained at the beginning of the program, Gordon (1973) has recently reported Binet IQ's for each group five years after intervention was started; that is, from two to four years after "graduation." Of the seven experimental groups, the only three that still differed from controls by more than five IQ points (with means from 95 to 97 in the last year of follow-up) were those that had received parent intervention in the first year of life and continued in the program for either one or two consecutive years. Groups which started parent intervention later, whose participation was interrupted for a year, or who were exposed to parent and group intervention only simultaneously, did not do as well. Moreover, the addition of group intervention in the third year did not result in a higher IQ for those groups that had this experience. Indeed, in both instances in which parent intervention in the second year was followed by the addition of preschool in the third, the mean scores showed a drop over the two year follow-up period. In contrast, the two groups for whom parent intervention was continued for a second year without the addition of a group program either held their own or gained during the follow-up period, despite the fact that they were tested three rather than only two years after intervention had ended.

Looking at the results in greater detail, of the four groups tested two years after leaving the program, the only one showing significantly greater superiority over the controls (8 points) had had two years of parent intervention beginning in the first year of life, with group intervention added in the third. Next in line were the children entering at two years of age who had received one year of home visits with a group program added in the second year. Although this group had showed a reliable superiority over the control group one year after completion of intervention, by the second year of follow-up their mean score had dropped several points so that the difference was no longer reliable. The lowest mean IQ scores were obtained by the two samples who had attended the group program in the third year with no parent intervention in the preceding year.

Of the two groups tested three years following termination, the one that had received only parent intervention for the first two years of life still differed significantly from the controls. The second group, which had experienced only one year of parent visits at age 2, did not show a reliable difference. Finally, the one group that had been exposed to parent intervention only during the first year of life was still a significant nine points higher in IQ four years after leaving the program. Moreover this group was the only one to show a rise in IQ between the end of intervention and the most recent testing four years later.

Taken as a whole, Gordon's results lend support to the following conclusions.

1) The generalization that parent intervention has more lasting effects the earlier it is begun can now be extended into the first year of life.

[15] A program involving such a phased sequence is currently being carried out by Gordon (1971). A weekly home visit is conducted for the first two years of life, with a small-group setting being added in the second and third years. At the end of three years significant differences between the experimental and control group were found both in mothers' attitudes and behavior and in the children's language development. Neither general measures of intelligence nor any follow-up data have been reported as yet.

2) When parent intervention precedes group intervention, there are enduring effects after completion of the program, at least throughout the preschool years.
3) The addition of a group program after parent intervention has been carried out for a one- or two-year period clearly does not result in additional gains, and may even produce a loss, at least when the group intervention is introduced as early as the third year of life.

But, what if the preschool component is not added until the children are four or five years old? Data bearing on the questions are available from two experiments reported by Radin (1969, 1972).

The SKIP Experiment: In order to provide a meaningful follow-up experience in school for children completing preschool programs, Weikart and his coworkers established the Supplementary Kindergarten Intervention Program, known by the acronym SKIP (Radin 1969). The program involved two components. One was a special class supplementing the regular kindergarten session with a Piagetian curriculum emphasizing cognitive development. The second component is described as entailing "intense parent involvement in the educative process." This phase of the program was implemented by a "home counselor" who, in a series of visits, planned activities with the mother which paralleled those being carried out by the child at school. Since the latter spent the full day attending either regular or SKIP kindergarten, he was not present during the home visit. The activities suggested by the counselor for the mother to carry out with her child were specifically designed to meet the child's developmental needs as diagnosed by his kindergarten teacher. There was a strong cognitive element:

> Some activities focused on classification on one criterion, then according to another. Others emphasized ordering objects in a single dimension (seriating). Still others centered on "if-then" relationships. (Radin 1969, p. 258)

At the same time, care was taken to cast the mother in an active role.

> At all times, effort was made to have the mother see herself as a resource person capable of helping her child to learn. Few materials were taken into the home. Rather, items typically found in the kitchen or living room, such as toss pillows and dishes, were used as instructional material. It was felt that only in this way would the mother lose her awe of the teaching process and gain confidence in her own abilities. (Radin 1969, p. 253)

Because the issue of stabilization of initial gains was regarded as most critical for disadvantaged children of high ability, the SKIP program selected for admission disadvantaged children who had IQ's in the upper 40 percent of those who had just "graduated" from local preschools and were about to enter kindergarten. These 36 youngsters were divided into three groups of 12, matched on sex, race, and Binet IQ. They were also found to be roughly comparable in number of children in the family (between 4 and 5) and age of mother (early thirties). Group I received the full program. They attended a supplementary SKIP class four half-days per week when the regular kindergarten was not in session; in addition, their mothers received biweekly visits from a counselor. Group II attended supplementary SKIP classes but their mothers were not visited. Group III, the control sample, was offered no program beyond their regular half-day kindergarten class.

Over the course of the academic year Group I made a gain of 14 points in IQ, significantly larger than that for the other two, whose 6 and 7 point increases were not reliably different. Similar results were obtained on the Metropolitan Reading Readiness Test. The mothers' responses to a questionnaire measuring stimulation taking place in the home before and after the program showed significant improvement for Group I only.

The critical analysis, however, turned out to be the comparison between children who had attended a preschool program involving an intensive parent intervention program and those who had not. Two of the preschools had contained this element; in the third (ironically a Head Start class), this feature was absent. Although the N's were small, the trend was unmistakable. The largest gain in IQ of 16 points was made by the children in Group I who had also been involved in a parent intervention program during their preschool years. This increase was significantly greater than that obtained by all the rest of the sample (averaging 6 points). Next in line were the children in Groups II and III who had also attended this kind of preschool, with gains of 11 and 10 points respectively. All the children who had not previously participated in a parent intervention program during preschool showed smaller increases than those who had had this experience. Moreover, whereas the children in Groups I and III showed reliable increases of 6 and 7 points respectively, those from Group II actually showed a loss of 6 points.

The full significance of this pattern of results becomes evident when we take note of the following facts.

1) All of the children whose preschool experience had included a parent intervention component made significantly higher gains than those who had attended preschools without this element.[16] (The mean increases for the two samples were 13.7 and 2.5 points respectively.) This trend was apparent even for those children not enrolled in the SKIP curriculum.
2) Among children whose preschool experience *had* included parent intervention, exposure to a supplementary Piaget-type curriculum did not result in any extra gain in IQ *unless their mothers were also receiving home counseling.* The children in the SKIP program whose mothers were not visited essentially made no higher gains than those enrolled in regular kindergarten.
3) Among children whose preschool experience had *not* included parent intervention, half-day regular kindergarten supplemented by another half-day of a specially-designed Piaget-type curriculum did not produce additional IQ gain.
4) Children who experienced no parent intervention either in preschool or school, but who spent the full day first in a regular and then in a special kindergarten program fell 6 points in IQ during the kindergarten year.
5) No such drop was shown by children who either
   a) attended the regular but not the special kindergarten and hence were home half the day with their mothers
   b) attended both the regular and special kindergartens for the full day, but whose mothers participated in the biweekly home intervention program.

Although taken by itself this pattern of results might be seen as a chance phenomenon in view of the small number of cases involved, its remarkable consistency with the principal conclusions derived from a large number of studies examined in this analysis suggests that the findings are valid. Specifically, Radin's results, viewed in the context of the studies reviewed earlier, point to the following conclusions:

a. Although parent involvement in the later preschool years does not by itself produce large gains in mental development, it increases the impact of any subsequent group intervention carried out in school, particularly if a program which enlists the parent in support of the child's learning activities is continued into the primary grades.

b. In contrast, the absence of parent involvement in the preschool period, or the failure to carry over this component into the early grades, reduces the impact of any classroom intervention program, particularly if the latter, by keeping the child for the full day, reduces the time that he might otherwise spend with his parents.[17]

Radin (1972) has just replicated her findings in a second study designed to provide a direct test of the hypothesis that prior exposure to parent intervention enhances the impact of subsequent group programs. Three matched groups of 21-28 four-year-olds from lower class homes were exposed to a preschool program supplemented with bi-weekly home visits. In one group, the visitor worked directly with the child, the mother not being present. In a second group, the visitor employed the same activities as a basis for encouraging mother-child interaction. In the third group, mother-child intervention was supplemented by a weekly group meeting led by a social worker and focusing on child rearing practices conducive to the child's development. At the end of the first year, all three groups made significant gains in IQ but did not differ reliably from each other. In addition, the mothers in the two treatments involving parent intervention showed changes in attitude interpreted as more conducive to the child's development, with the greatest shift observed in the group receiving home visits supplemented by weekly meetings.

During the following year, when the children were attending regular kindergarten (with no parent intervention program), the children who had been tutored directly in the preceding year made no additional gains in IQ, whereas the two groups exposed to prior

[16] Since the children had not been assigned on a random basis to preschools with and without a parent involvement component, it is conceivable, but unlikely, that some other correlated factor accounts for the observed difference.

[17] It may be significant in this regard that, of the longitudinal group intervention projects described in Tables 1 and 2, the two which produced the smallest initial experimental effects (Herzog and Beller) were the only ones to have full-day programs. The issue is confounded, however, by the fact that they both also employed a traditional nursery school approach with emphasis on free play rather than structured cognitive experience.

intervention achieved further increases of 10 to 15 points. Radin concludes:

> In general the findings of this study suggest that a parent education component is important if the child is to continue to benefit academically from a compensatory preschool program, although there may be no immediate effect on the youngsters. . . . A parent program does appear, however, to enhance the mothers' perception of themselves as educators of their children and of their children as individuals capable of independent thought. Thus, perhaps, new maternal behaviors are fostered which are conducive to the child's intellectual functioning. (p. 363)

It is to be emphasized that Radin's parent program, like all the other effective parent strategies we have examined, focuses attention on interaction between parent and child around a common activity. This approach is to be distinguished from the widespread traditional forms of parent education involving courses, dissemination of information and counseling addressed only to the parent. There is no evidence for the effectiveness of such approaches. (Amidon and Brim 1972)

In terms of implications for program development, Radin's results warn against the complete continuation of parent involvement strategies once the disadvantaged child enters school. To do so is to risk the fate of "washed out" gains characteristic, to a greater or lesser degree, of every preschool project we have examined. But the same proviso carries a constructive implication. As we have seen, there are grounds for believing that if a strong parent intervention program is continued into the early grades, initial gains can be sustained and perhaps even extended.

In summary, Radin's results call attention to still another fringe benefit of parent intervention. To expand our earlier chemical analogy, this approach not only provides a *fixative* that conserves effects achieved through intervention; it also serves as a *catalyst* which enhances the impact of other programs which may accompany or follow the parent intervention phase.

Early Intervention, How Late?

How long does parent involvement continue to exercise such benign powers? Radin's data indicate that the beneficial influence is substantial if parental intervention is introduced before the child enters school, but the effect is reduced if home visits are not begun until the kindergarten year.

But what if the child is six, or eight, or older? Is it then too late for parent intervention to exercise its conserving and catalytic power. Unfortunately, there is little research on the question, primarily because in American society the school undertakes to educate the child without family interference. The causes and consequences of this development have been summarized by this writer elsewhere (Bronfenbrenner 1972b). In recent years, however, primarily as an outgrowth and extension of family-oriented preschool intervention programs, there have been attempts to break with tradition, and to evaluate the consequences. The results not only call the tradition into question but offer promise for the future.

Parental involvement in Project Follow-Through. The most important and widespread development of this kind is of course Follow-Through, which includes as one of its defining features the involvement of parents both in major decision-making and in the day-to-day operations of the program. We have already reviewed the results of preliminary analyses suggesting that this national effort is producing cognitive gains through the first grade, especially on the part of children who had the prior benefit of Head Start. It is now appropriate to report from these same preliminary analyses findings on the attitudes and activities of the parents (Stanford Research Institute 1971a, 1971b). The results indicate that, in comparison with the control group, Follow-Through parents were more aware of their children's school programs, more likely to visit school and work in classrooms as paid volunteers, more likely to talk to teachers and other school staff, and more convinced of their ability to influence school programs. As before, these findings are subject to qualification because of failure to control for differences in parental education and other background factors between the Follow-Through and control samples. It remains to be seen whether more refined analysis will confirm the results and whether the gains continue to be maintained, and perhaps enhanced, as the children in the program proceed through elementary school. And even if the results continue to be encouraging, the design of the national study does not permit evaluation of the independent contribution of the home-based vs. classroom components of the program.

The "School and Home" Project. There is at least one study, however, that overcomes some of these shortcom-

ings. It evaluates the impact of a parent involvement program from kindergarten through sixth grade in the context of an appropriate experimental design (Smith 1968). Although the research is cross-sectional rather than longitudinal, this limitation speaks more directly to our interests since it permits assessing the effectiveness of parent involvement when it is introduced at later stages of the child's development. The project, carried out in Flint, Michigan, involved approximately 1000 children from low-income families, most of them Black, attending two public elementary schools. Children of similar socioeconomic background in another elementary school were selected as a control group. In the experimental schools, the regular curriculum was supplemented by a program requiring parents and teachers to work together in furthering the child's educational progress. The effort involved parents in activities both at home and in the school.

On the home front, parents, including fathers, were requested to read aloud to their children, listen to their children read, read regularly themselves in the presence of their children, show interest by looking at the child's work, and give encouragement and praise as needed and deserved. In addition, parents were asked to provide a quiet period in the home for reading and study. During this time the television or radio was to be turned off, telephone callers were asked to phone back later. Parents were requested to occupy the attention of younger children. The parents were not asked to help the child with homework; instead, they were informed that the teacher would be checking on whether the child did his work rather than how well the task was done. "Every child could therefore be successful, provided that his parents were giving the needed support at home." (Smith 1968, p. 97)

The parents were also encouraged to get the child to bed regularly each night, and get him up each morning "with adequate time for a good breakfast" (Smith 1968, p. 94). A children's dictionary was also made available to each family with a child in grades four through six. Families were asked to write their names in the dictionary and encourage its use. Many other innovations were introduced to provide support in the home for the child's activities at school.

The program also brought the parents into the school. This was accomplished by a group of 30 volunteer mothers who assigned themselves specific blocks in the school district and made a personal call on every family inviting the parents to a program "to learn what they could do to help their children achieve better in school." (Smith 1968, p. 95) Parents who did not attend a meeting were visited by a parent who had, and were brought up to date. In addition, parents and other residents of the neighborhood who held skilled jobs were asked to visit classrooms in order to explain their work and to indicate how "elementary school subjects had been important to them in their lives." (Smith 1968, p. 102)

Parents' reactions to the program were solicited in a questionnaire which resulted in a 90 percent return. Particularly favorable attitudes were expressed toward the home study program and reading experiences. Ninety-nine percent of the respondents wished the program to continue.

Unfortunately, systematic data on the children are limited to gain scores on tests of reading achievement administered in Grades II and V. Since the two tests were administered in November and May, the normal increase would be expected to be five months. In the second grade, this gain was in fact achieved both in vocabulary and comprehension measures. The grade equivalent of the combined gain score for one experimental school was 6.4, the other 5.1; the corresponding rise in the control group was 3.9, a difference that is significant both statistically and psychologically. At the fifth grade level, the two experimental groups exceeded both the norms and the control group in the test of vocabulary but only one of the groups "fulfilled its quota" on measures of reading comprehension. This pattern is reflected in the grade equivalents of the combined gain scores, which were 6.0, 3.7, and 1.7 respectively.

Since in both the second and fifth grades parent involvement was being introduced for the first time, the results indicate that parent intervention is effective even with children who are initially exposed to this experience at ages 11 or 12. What would have happened had parent involvement taken place continuously from kindergarten on? If the results of studies at earlier ages (Levenstein, Radin, Follow-Through) can be taken as a valid indication, the effects would have been cumulative both in magnitude and in staying power, but this expectation needs to be confirmed in actual practice.

One other feature of the Smith project is especially noteworthy. For the school age child parent involvement took a different form from that in the preschool years. Instead of being directly involved in the teaching of the child, the parent was asked to take a supportive role to

reinforce educational activities instead of participating in them. Indeed the instructions to the teachers stipulated that the assigned home activities "should require no teaching by the parent." (1968, p. 96) This meant that every parent could do his part without having to be in command of school subject matter. And the research results indicate that the supportive function had a significant effect on the child's learning. Once again the family emerges as the system which sustains and facilitates development spurred by educational experience outside the home.

When Is Intervention Most Effective? The findings of Smith's study, however, should not be taken to mean that children for whom parent intervention is introduced at later ages will benefit as much as those for whom it is begun earlier, especially in the preschool years. We know that this strategy is optimally effective in the first three years of life and there is some evidence that the effects are cumulative, at least during the preschool years, as revealed in results obtained by Levenstein (at ages 2 and 3), Radin (ages 4 and 5), and the Follow-Through Program. (Children who had been in Head Start did better than those who had not, although this result needs to be checked with a more refined analysis controlling for parents' education.)

In summary, intervention programs which place major emphasis on involving the parent *directly* in activities fostering the child's development are likely to have constructive impact at any age, but the earlier such activities are begun, and the longer they are continued, the greater the benefit to the child. The optimal period for such intervention is during the first three years of life.

It is important to recognize that the above conclusion applies to a particular form of early intervention and not to any and all intervention strategies. There is no evidence from this analysis, for example, that preschool programs in group settings produce greater, more enduring, or cumulative gains if children are entered earlier and remain longer under treatment. The specificity of the critical period to parent intervention reflects the facts that the focus of attention in this strategy is not the child but the parent-child system which, once activated at a constructive level, can both foster and sustain the child's development as a function of educational experience both within and outside the family.

But one major problem still remains. Given that the optimal period for parent intervention is in the first three years of life, or at least before the child enters school, implementation of this strategy still requires the cooperation of the family. And, as we have already noted, many disadvantaged families live under such circumstances that they may be neither willing nor able to participate in the activities required by a parent intervention program. Does this mean that the best opportunity for the child must be foregone? Is there any alternative course? In our last section we turn to an examination of the problem and some possible solutions.

VII. THE ECOLOGY OF EARLY INTERVENTION

If we are to find an appropriate strategy of intervention for the child of a family living in the depths of poverty, we must first understand the nature of the problems the parents face in seeking to bring up their children. Some indication of these problems appears in the reports of the two projects which attempted to institute some form of parent program with families from relatively more deprived environments. These were the Gray and Weikart studies. We have already considered several reasons why the fairly substantial home-visit components in these two programs did not produce the gratifying results achieved by Levenstein. But what if a combination of Levenstein's semi-weekly intensive home visits and Karnes' group meetings for mothers had been employed with Gray's or Weikart's samples? For that matter, given the clearly stated recognition by both of the latter investigators of the importance of fostering mother-child interaction around a common task, why did they not give greater emphasis to such activities in their home-based programs? A somewhat sobering answer to both these questions is found in the careful reports of both researchers. Witness the following account from Gray's program:

> A first objective of the home visitor was to involve the parent as an active participant in the project. This was no easy task, because most of the parents were experiencing the helplessness that so frequently characterizes deprived populations. Many of the homes had no father present; consequently, the mother had to work at low-paying jobs for long hours. In addition, she had the responsibility for the care of a large family, without many of the conveniences of middle class homes. As a result, most of the mothers carried responsibilities that sapped their energies, both

physical and emotional. Thus, any requests that demanded additional time and energies would seem overwhelming. (Klaus and Gray 1968, p. 21)

In the Weikart project some of these same problems are documented in quantitative terms. For example, over 30 percent of the home visits could not be completed because no one was at home. From the point of view of demonstrating and teaching, one of the major problems was inadequate illumination; lighting was rated in the lowest step of a four-point scale in 50 percent of the homes. The mother's participation, rated on a three-point scale, was described as no more than "slight" in 20 to 25 percent of the visits. On the average, three children were present during the training visit, and the rise in IQ score was inversely related to the number of children in the room at the time of the visit. A second factor associated with lower IQ gain was residence in public housing. On this score, the authors had the following to say:

> One hypothesis is that the dense concentration of lower lower-class families, typical of public housing, results in a scarcity of children and parents who are school-oriented and can serve as models. The second hypothesis relates to the characteristics of those who seek and secure public housing. Perhaps in this decade, residence in a governmental project carries the stigma of poverty and is avoided by those who are upwardly mobile. The home environment of individuals with higher aspirations may not be sufficiently stimulating to permit full intellectual development in young children, yet it may be capable of establishing the foundation for future growth. Thus, children raised in this milieu may be better able to respond to a highly enriched nursery school program. (Radin and Weikart 1967, p. 189)

The presence of other children is seen by the authors as interfering with the mother's responsiveness and as a source of distraction for the target child. In the investigators' view, this finding points to the "necessity for privacy" if the training sesssion is to be effective.

What these data and observations indicate is that the situation under which the more severely deprived families have to live often does not permit the kind of sustained effort in a one-to-one relationship with the child that is required in Levenstein's approach.

But thus far we are still dealing with families who are prepared to admit a stranger into their home and to participate with him in creating an educational experience for their child. This already implies a degree of motivation and organization that is not likely to be found among families living in the most oppressive and impoverished circumstances.

The Scope of Deprivation. How many families are there whose conditions of life are such that it becomes difficult to meet the basic psychological needs of their children? The following statistics provide some indication.

> Among families living in poverty, 45 percent of all children under six were living in female-headed households; in non-poverty families the figure was only 3.5 percent. In two-parent families where the husband earned less than $7,000, 35 percent of the mothers worked. These women work because they have to.
>
> There are nearly six million preschool children whose mothers are in the labor force. Of these, one million live in families below the poverty line (e.g. income below the $4,000 for a family of four). An additional one million children of working mothers live in near poverty (income between $4,000 and $7,000 for a family of four). All of these children would have to be on welfare if the mother did not work. Finally, there are about 2.5 million children under six whose mothers do not work, but where family income is below the poverty level. Without counting the many thousands of children in families above the poverty line who are in need of child care services, this makes a total of about 4.5 million children under six whose families need some help if normal family life is to be sustained. (Bronfenbrenner and Bruner 1972, p. 41)

Breaking the Ecological Barrier. What kind of program can reach the children of these families and set them on the course of normal development?

The Milwaukee Project. There is a radical answer to this question, and it is being tried. It involves essentially removing the child from his home for most of his waking hours, placing him in an environment conducive to his growth, and entrusting primary responsibility for his development to persons specifically trained for the job. This is the strategy being employed (Heber *et. al.*, 1972) in an unusual experiment conducted by Heber (Rehabilitation of Families at Risk for Mental Retardation, 1971). The sample consisted of Black mothers of newborns who were living in an economically depressed area of Milwaukee and had IQ's of 75 or less. Case

studies included in the progress report leave no doubt of the severely deprived status of the homes. Forty mothers and their babies were assigned at random to an experimental or control group. In the experimental group, separate intervention programs were established for mother and child. Recognizing that deprivation begins to exert its destructive impact early in life, Heber initiated intervention for the children when they were three months of age. At this point each child was assigned a highly trained teacher who:

> . . . was responsible for his total care, including: feeding and bathing, cuddling and soothing, reporting and recording general health, as well as organizing his learning environment and implementing the educational program. . .During a brief period of 2 to 8 weeks. . .the teacher worked with her child in the home until the mother expressed enough confidence in the teacher to allow the child to go to the center. (*Ibid*, pp. 51-52)

The teachers were paraprofessionals selected from the same neighborhood in which the children lived, "thus sharing a similar cultural milieu." (*Ibid*, p. 49) Persons selected were those who, in the judgment of the staff, were "language facile, affectionate people who had had some experience with infants or young children." (*Ibid*, p. 49)

The center was a 14-room duplex house with many "nooks and crannies where teachers could work with children on a very intimate one-to-one basis." (*Ibid*, p. 57) The children stayed at the center from 8:45 in the morning until 4:00 in the afternoon. Each child remained with his primary teacher until he reached 12 to 15 months of age. At that time he was paired with other teachers and children so that by about 18 months he was grouped with two other children and came into contact with three different teachers. From 18 months each teacher was given responsibility for approximately ten children whom she saw in groups of 2 to 4 depending on age. The teacher was required to familiarize herself with one of the three academic areas (mathematics, language, reading). The three teachers in each classroom shared responsibility for other areas, such as art and music.

At the beginning of the project there were 20 teachers for the 20 infants. As the children got older, the program took on more of the features of preschool, some younger children were added, and the center was moved to a building containing six classrooms. At the time of the most recent progress report, there were 25 children between the ages of 2 and 5 being cared for by 9 teachers – approximately a 3 to 1 ratio.

The educational program is characterized by the authors as "having a cognitive-language orientation implemented through a structured environment by prescriptive teaching techniques". (*Ibid*, p. 57) An examination of the curriculum suggests that it belongs in Bissell's (1970) "structured-cognitive" category, and hence can be expected to be quite effective.

Before turning to the results of intervention with the children it is important to take note of the parallel program conducted for their mothers. This involved two phases. The first was a job training program to raise their employment potential. The work for which they were trained was that of nurse's aide in a private nursing home. The mothers were first taught some basic skills in reading, writing and arithmetic and then given on-the-job training in two nursing homes.

The second phase of the program involved training in homemaking and childrearing skills. The status and degree of success of these two training programs is summarized by Heber as follows:

> While the occupational rehabilitation component of the maternal program appears to have been quite successful to date, major problems with respect to adequacy of homemaking skills and care and treatment of children remain to be resolved with a number of experimental families. With many of the mothers now successfully employed, the maternal program is shifting to an increased emphasis on training in general care of family and home, budgeting, nutrition and food preparation, family hygiene and the mother's role in child growth and development. (*Ibid*, pp. 71-72)

No such qualification is in order with respect to results of the program for the children. At the time of the latest report the original infants were about 5½-years of age. On a variety of measures, the experimental and control groups began at the same point and then diverged, the differences between them increasing over the years. The IQ data present a typical picture. At one year of age, both groups scored a mean just under 115, not unusual on infant tests. By two years of age the experimental group had risen to 120, the controls had dropped to about 95. At three, the experimentals had risen slightly and the controls fell a comparable amount. At 5½, the mean IQ for the experimental group was 124, for the control group 94, a difference of 30 points. (Heber *et al.* 1972)

These results raise a number of important questions of science, of practicality, and of ethics. At the moment,

our concern is with the first two categories. With respect to cognitive development, there can be little question that the program has been astoundingly successful and will probably continue to be so as long as intervention lasts. The success is entirely to be expected since the program fulfills every requirement we have stipulated as essential or desirable for fostering the development of the young child. It began by creating an enduring one-to-one relationship involving reciprocal interaction around activities challenging to the young child. With the teacher still remaining the primary agent of intervention, group experiences were gradually introduced emphasizing language and structured cognitive activities. The entire operation is being carried out by a group of people sharing and reinforcing a common commitment to young children and their development. In short, all the requirements of the sequential strategy are being met and the child is developing accordingly. The first problem will arise if and when intervention is discontinued. What will happen then is an open question. If the children remain with their mothers and enter the schools in their deprived neighborhoods, it is unlikely that they will maintain their superior levels of mental development.[18] Even though the mothers' jobs and skills have been upgraded, it seems doubtful that they, or other members of the family, will be able to sustain the children's development, an activity for which the family has received no special preparation and in which they have played only a secondary part since the child was three months old. If the children obtain sources of stimulation and support outside the home and neighborhood, their cognitive development may continue to flourish. But whatever happens to them intellectually, serious questions arise about their development in other spheres, especially in terms of identity formation in their relation to their family or to other children in the neighborhood from whom they are partially isolated so long as they continue in the program.

Until the data come in, the answers to these questions must remain speculative. But in one future domain the facts seem clear. The program is, and will continue to be, as expensive as it is effective, perhaps more so. And in terms of large-scale applicability, the costs are prohibitive.

Is there another approach? Is there some other way to reach the child in the severely deprived home and ensure his development without separating him from his family for most of the day and, at great cost, delegating primary responsibility for his development to highly trained personnel working in a specially designed setting in ways that are lien to his own family and background?

The Skeels experiment. There is an affirmative answer to these questions and it is backed up by factual evidence, indeed by an IQ gain exactly as great and demonstrably far more enduring than that presently achieved in the Milwaukee Project. The evidence comes from Skeels' (1966) remarkable follow-up study of two groups of mentally retarded, institutionalized children, who constituted the experimental and control groups in an experiment he had initiated thirty years earlier. (Skeels, Updegraff, Wellman, and Williams, 1938; Skeels and Dye, 1939) The average IQ of the children and of their mothers was under 70. When the children were about two years of age, thirteen of them were placed in the care of female inmates of a state institution for the mentally retarded with each child being assigned to a different ward. The control group was allowed to remain in the original – also institutional – environment, a children's orphanage. During the formal experimental period, which averaged a year and a half, the experimental group showed a mean rise in IQ of 28 points, from 64 to 92, whereas the control group dropped 26 points. Upon completion of the experiment, it became possible to place eleven of the experimental children in legal adoption. After 2½ years with their adoptive parents, this group showed a further nine-point rise to a mean of 101. Thirty years later, all of the original thirteen children, now adults, in the experimental group were found to be self-supporting, all but two had completed high school, with four having one or more years of college. In the control group, all were either dead or still institutionalized. Skeels concludes his report with some dollar figures on the amount of taxpayers' money expended to sustain the institutionalized group, in contrast to the productive income brought in by those who had been raised initially by mentally deficient women in a state institution.

[18] In a recent interview, Caroline Hoffman, Director of the preschool program of the Milwaukee Project stated that the children are about to enter first grade in the regular Milwaukee schools. "We won't know until then whether they can maintain their high standings, or whether, cut loose from our special training and away from this special environment, they will begin to slip back." (N.Y. Times, July 17, 1972)

The Skeels experiment is instructive on two counts. First, if Heber demonstrated that disadvantaged children of mothers with IQ's under 75 could, with appropriate intervention, rise 28 points in IQ to well above the norm, Skeels showed that retarded mothers themselves can achieve the same gains for children under their care at substantially less expense. How was this accomplished? The answer is found in Skeels' observations and analysis of what occurred in the wards:

> . . . it must be pointed out that in the case of almost every child, some one adult (older girl or attendant) became particularly attached to him and figuratively "adopted" him. As a consequence, an intense one-to-one adult-child relationship developed, which was supplemented by the less intense but frequent interactions with the other adults in the environment. Each child had some one person with whom he was identified and who was particularly interested in him and his achievements. This highly stimulating emotional impact was observed to be the unique characteristic and one of the main contributions of the experimental setting. (Skeels 1966, p. 17)

But the interpersonal relationship was not the only feature that contributed to the children's development. There were at least two other significant elements:

> . . . the attendants and the older girls became very fond of the children placed on their wards and took great pride in them. In fact, there was considerable competition among wards to see which one would have its "baby" walking or talking first. Not only the girls, but the attendants spent a great deal of time with "their children" playing, talking, and training them in every way. The children received constant attention and were the recipients of gifts; they were taken on excursions and were exposed to special opportunities of all kinds. (Skeels 1966, pp. 16-17)

> The spacious living rooms of the wards furnished ample space for indoor play activity. Whenever weather permitted, the children spent some time each day on the playground under the supervision of one or more older girls. Here they were able to interact with other children of similar ages. Outdoor play equipment included tricycles, swings, slides, sand boxes, etc. The children also began to attend the school kindergarten as soon as they could walk. Toddlers remained for only half the morning and 4- or 5-year-olds, the entire morning. Activities carried on in the kindergarten resembled preschool rather than the more formal type of kindergarten. (Skeels 1966, p. 17)

Taken together, these three features constitute three essential components of the sequential strategy we previously identified from other research as optimal for the development of the young child: The initial establishment of an enduring relationship involving intensive interaction with the child; priority, status, and support for the "mother-child" system; the introduction, at a later stage, of a preschool program, but with the child returning "home" for half the day to a highly available mother substitute. The only element that is missing is the systematic involvement of the child in progressively more complex activities, first in the context of the mother-child relationship and later, in the curriculum of the preschool program. Had these elements of cognitively challenging experience been present, it is conceivable that the children would have shown even more dramatic gains in IQ, approaching the levels achieved by Heber's experimental group.

Ecological Intervention as a Strategy. Both the Heber and Skeels experiments also include a new element not present, at least in significant form, in the other intervention programs we have examined. This element is in fact the most critical, for it gives rise to all the other conditions essential for intervention to be effective. This "enabling act" took the form in both instances, of a major transformation of the environment for the child and the persons principally responsible for his care and development. In the Heber project the restructuring was accomplished by delegating primary responsibility for the child's development to specially trained personnel in a setting specifically designed for the purpose. In Skeels' experiment, the transformation of the environment involved removing the children from the orphanage, and placing them, one to a ward, in the institution for mentally-retarded female adults. We shall refer to this kind of reorganization as *ecological intervention* since it requires a major change in the environment in which both mother and child are living. The essence of the strategy is a primary focus neither on the child nor his parent nor even the dyad or the family as a system. Rather, the aim is to effect changes in the *context* in which the family lives; these changes in turn enable the mother, the parents, and the family as a whole to exercise the functions necessary for the child's development.

Our purest case of ecological intervention, therefore, is found in the Skeels' experiment. There entire new patterns of behavior were produced by placing the child and his mentally retarded *de facto* foster mother in an environment in which the basic needs for life were already met and the care of the child became a major activity receiving the social support of the entire community. There was no training program for either mother or child; the situation simply provided *opportunity and status for parenthood*, and the participants in the situation took it from there.

The presence of such an opportunity of course does not guarantee that normal development will take place. There is little question, for example, that Skeels' children would not have maintained their impressive IQ gains had they remained in the institution in later childhood instead of being adopted. In fact, the two cases who stayed longest began to show a drop before they left. But if the presence of the opportunity for a parent to fulfill the role has no certain consequences, its absence is unequivocal in terms of the effect on the child; so long as the situation does not permit parental functions to occur, the child's development is impaired. This conclusion is clearly indicated in the results of Bronfenbrenner's analyses (1968a, 1968b, 1972a) of published research on effects of early deprivation and stimulation. These analyses led to the formulation of two general principles. The first, which we have already cited, defined the properties of the reciprocal system necessary to foster and sustain the development of the young child. The second stipulated the conditions which this system in turn required for its creation and survival.

> The extent to which such a reciprocal system can be developed and maintained depends on the degree to which other encompassing and accompanying social structures provide the place, time, example, and reinforcement to the system and its participants. (Bronfenbrenner 1972a, p. 10)

The need for ecological intervention arises when the foregoing prerequisites are not met by the environment in which the child and his family live. This is precisely the situation which obtains for many, if not most, disadvantaged families. The conditions of life are such that the family cannot perform its childrearing functions even though it may wish to do so. Under these circumstances no direct form of intervention aimed at enhancing the child's development or his parents' childrearing skills is likely to have much impact. Conversely, once the environmental prerequisites are met, the direct forms of intervention may no longer seem as necessary. After all, middle class families, who are well fed, well housed, well cared for medically and well educated, do not need special intervention programs either for parents or for children to insure that the latter can learn in school. These families seek such programs, however, in order to enable the child to realize his full potential, and are probably well advised to do so.

The implication of the foregoing discussion is obvious. *Ecological intervention must be the first step in any sequential strategy of the type we have proposed.* It may well be that the most powerful technique for achieving substantial and enduring growth in IQ, and in other more significant spheres of development, for children living in the most deprived circumstances *is to provide the family with adequate health care, nutrition, housing and employment.*

Unfortunately, researchers have not given consideration to so simple-minded a hypothesis so that there is little direct evidence to support or challenge its validity. Data consistent with such an expectation, however, abound in the results of this analysis. Repeatedly we have observed that the effectiveness and, indeed, the feasibility of intervention varied inversely with the degree of deprivation. The children from the least disadvantaged families were those who profited most from early intervention, or, for that matter, were even enrolled in the programs in the first place. The neediest families were not even reached.

But if ecological intervention is the answer, what is keeping us from carrying it out? The answer to this question is found in what is virtually a defining characteristic of the strategy: *ecological intervention almost invariably requires institutional change.* Where families are living in difficult but still viable circumstances, the institutional change may involve no more than the formation of a group committed to a common activity, as with Karnes' mothers. But where basic needs for survival and growth are unfulfilled, the necessary institutional changes are more far-reaching and difficult to achieve. But unless such changes are effected, more direct forms of intervention, be they home visits, preschool programs, or both, can have little impact on the most deprived families, whose children stand in greatest need of help.

Opportunity and status for parental activity. But even when the basic needs for survival are met, the conditions of life may be such as to prevent the family from functioning effectively in its childrearing role. As we

have seen, an essential prerequisite for the child's development is an environment which provides *substantial opportunity and support for parental activity.* If, to provide an adequate income, both parents have to work full time, it becomes extremely difficult for either of them to carry on the kind of sustained patterns of interaction that we have found to be essential for the development of the young child. It will be recalled that, in Karnes' parent intervention project for one- and two-year-olds (Karnes *et al.* 1970), the disadvantaged mothers who were employed full time showed the poorest quality of mother-child interaction and this inferiority was reflected in the development of their children. Although the finding needs to be replicated in larger samples, it seems highly likely that it reflects a serious obstacle to effective parent intervention in the early years.

The results of Heber's project, and even more than those of Skeels, suggest that, in the last analysis, it is the absence vs. presence of adequate opportunity and status for parental activity that is the most crucial factor affecting the early development of the disadvantaged child. Once children from severely deprived backgrounds were placed in a situation where such opportunity and status prevailed, even though in the wards of an institution at the hands of its mentally retarded inmates, the interactive processes so necessary to the children's development were set in motion and the children prospered. As we have already noted, it is the presence of these interactive patterns that primarily distinguishes the early childrearing practices of middle class families from those living in poverty. (Bee *et al.* 1969; Hess, Shipman, Brophy, and Bear 1968, 1969; Kagan 1968, 1971; Tulkin and Cohler, in press; Tulkin and Kagan 1970)

The Skodak and Skeels study. The significance of this difference is dramatized in an important investigation by Skodak and Skeels (1949) of the effects of adoption on the development of 100 children whose true parents were both socioeconomically disadvantaged and mentally retarded. The children were separated from their true mothers before six months of age and placed in foster families who "were above the average of their communities in economic security and educational and cultural status." (Skodak and Skeels 1949, p. 88) The average IQ of the children's true mothers was 86; by the age of 13 the mean IQ of their children placed in foster homes was 106. In an attempt to identify the critical factors producing this difference, Skodak and Skeels compared the characteristics of those foster homes in which children had shown significant gains in IQ over a ten year period (N = 7), and those in which the children had remained stable or shown some loss (N = 11). At the time of the first testing, when the children were 2½ years old and had been with the foster family for most of the period, the mean IQ's for both groups were already above average, 117 and 114 respectively. By age 13½ there was a difference of 25 points in IQ between them (104 vs. 129). In view of the homogeneous social and cultural backgrounds of the foster parents, neither education nor occupational level discriminated between the two sets of homes. The decisive factors which emerged are the same as those previously identified in other studies.

> There is considerable evidence for the position that as a group these children received maximal stimulation in infancy with optimum security and affection following placement at an average of three months of age. The quality and amount of this stimulation during early childhood seemed to have little relation to the foster family's educational and cultural status. (Skodak and Skeels 1949, p. 111)

The three highly successful examples of ecological intervention we have described have scientific and social significance that extends beyond the children and families directly affected. This significance is threefold.

1. The results demonstrate that *severely disadvantaged children of mothers with IQ's well below average (under 75 in Heber's project, below 70 in Skeels' follow-up study, and averaging 85 in the adoption research) are not doomed to inferiority by unalterable constraints either genetic or environmental.*
2. The findings show that substantial changes in the environment of the child and his principal caretakers can produce positive developmental changes considerably greater and more enduring than those achieved by the most effective intervention techniques when the home environment is left essentially unaltered. Thus the largest differences between experimental and control groups in group intervention programs ranged between 8 and 13 points in IQ, for parent intervention programs between 14 and 16 points, whereas for ecological intervention the differences were 25 to 28 points.

3. The processes and effects produced through ecological intervention substantiate the critical role in early development played by an enduring one-to-one relationship involving the child in verbal interaction with an adult around cognitively stimulating activities.

At the same time, all three examples of ecological intervention we have cited involved the radical change of transferring the child from his original oppressive environment into a more favorable one in which primary responsibility for his care was entrusted in persons other than his own parents. This is clearly a strategy of choice, both psychologically and morally when the true parents have no claim on the child, as occurred in both of the situations studied by Skeels and his colleagues. As we have already noted, however, such a course is problematic, both on scientific and ethical grounds, when the child still remains a member of his family. Under such circumstances, can anything be done for seriously disadvantaged families whose basic needs for survival are being met but whose lives are so burdened as to preclude opportunity for effective fulfillment of the parental role?

Family Support Systems. No answers are available to this question from our analysis of the research literature, for, as we have indicated, ecological intervention is as yet a largely untried endeavor both in our science and in our society. The available research does, however, identify some of the major ecological barriers to the effective operation of the family in its childrearing functions. Recognition of these barriers suggests measures which might make a difference, and therefore ought to be examined and perhaps tried on an experimental basis. We proceed with a series of such untested but promising strategies of ecological intervention. As we have anticipated, most of these measures require substantial changes in the major institutions of our society – not only those having direct impact on children and families – such as housing, health and welfare services, schools, churches, and recreation programs – but also other organizations and enterprises whose impact on family life is often unrecognized but nonetheless profound. These include primarily business and industry, but also urban planning, transportation, shopping facilities and a host of other conditions determining when and how a family can spend time with its children.

The proposals which follow make no attempt to be comprehensive. They address what appear to this writer to be the most urgent needs and represent examples of the kinds of possibilities that might be explored. All of these proposals have as their objective *providing support systems for families.* The proposals fall into four major areas: A. The family and the world of work; B. The family and the school; C. The family and the neighborhood; and D. The family and the home.

A. The Family and the World of Work.

1. *Provision and encouragement of part-time jobs for parents of young children:* no single parent of young children should be forced to work full time or more to provide an income at or below the poverty line. The statement applies with equal force to families in which both parents are compelled to work full time or longer to maintain a minimal subsistence level. Under such circumstances, a parent wishing to do so should be enabled to remain at home for part of the day. The following measures could help achieve this objective:

   a. Welfare legislation should be amended so as to encourage rather than penalize disadvantaged parents, especially single parents, who wish to work part-time in order to be able themselves to care for their own children.

   b. To free parents in poverty from full-time employment so that one of them can care for the children, Federal and State programs should provide funds for parental child care at home in lieu of wages.

   c. Employers should be encouraged by persuasion, union pressure, or State and Federal tax benefits, to create more part-time positions with priority in employment given to parents of young children.

   d. Federal or State legislatures should pass Fair Part-Time Employment Practices Acts prohibiting discrimination in job opportunity, rate of pay, seniority, fringe benefits and status for parents who seek or are engaged in part-time employment.

2. *Flexibility of work schedules.* Employers should be encouraged through persuasion, union pressures, tax benefits, or other means to modify work schedules so as to enable parents to be home when

their children return from preschool or school thus decreasing the need for babysitters during the child's working hours or for "latchkey" arrangements for older children.

B. The Family and the School.

3. *Parent apprentice programs in the schools.* Although many severely deprived families are not accessible to parent intervention programs, all future parents can be reached while they are still in school. Programs should be instituted as early as elementary school in which students of both sexes are given extended opportunities, under supervision, to participate in work with young children, including their own brothers and sisters. Such experience could be facilitated by locating day care centers, preschools, and Head Start Programs in or near schools, so that they could be utilized as an integral part of the curriculum. The older children would be working with the younger ones on a regular basis. In addition, they would escort the little ones to and from school or center, and spend some time with them out of school. Visiting the younger children in their own homes and observing and helping parents in their activities with the child would not only contribute to training for parenthood but also give recognition to the parent as a person of status and expertise. Parent intervention, of the kind developed in the Levenstein and Karnes projects, should be carried out for students and the youngsters under their charge.

4. *Breaking down the wall between family and school.* Further experimentation is needed along the lines of Smith's "Home and School" program to enlist parents in support of the child's activity in school through specific practices which they carry out in the home and to introduce parents as active participants in school programs by having them tell about their jobs, take groups of children to visit their place of work, and be identified to the children by teachers and administrators as important partners in the educational process. In particular, parents should play a leading role in the Parent Apprentice Program outlined above.

C. The Family and the Neighborhood.

5. *"Parent-Child Support Systems" in the neighborhood.* In every neighborhood there should be organized a *parent-child support system* on a cooperative basis. All parents with young children (as well as those expecting a first arrival) would automatically become members of the *support system* and any other residents in the neighborhood could join. The support system could be called upon, especially in times of emergency, for mutual assistance or advice in the care of children. It would also be the focal point for organizing parent intervention programs.

6. *Family neighborhood centers.* Essential to the operation of the family support system is a *family neighborhood center* where parents and others concerned with the care of the young can meet to see demonstrations, hear talks, share ideas, and discuss common problems. Students enrolled in parent apprentice programs (see above) would also participate in the activities of the center.

D. The Family in the Home.

7. *Pre-child parent intervention.* The optimal time to begin parent intervention is well before the child is born or even conceived. The first step in such intervention would be to insure the mother adequate medical care and nutrition prior to, during, and after the pregnancy. Provision should also be made at this time for adequate housing, and stable employment for the husband, if possible. At the very least the mother should be assured an adequate income during pregnancy and the early years of the child's life. Along with meeting these basic needs, a program of parent intervention could be instituted on the Levenstein-Karnes model including both group meetings and home visits. It would be essential for the expectant parents to work directly with a young child. Such opportunities could be created through the Parent-Child Support System in the neighborhood. Such a practice would also enhance a sense of common purpose, mutual assistance, and importance of the parental role among the members of the community.

8. *Homemaker service.* Many disadvantaged parents are unable to spend time in activities with their young children because of other demands in the home, such as care of old or sick relatives, meeting the needs of a large family, housekeeping under difficult conditions, and the like. Local residents trained as homemakers, or high school students in the parent apprentice program could take over

some of these responsibilities during regular visits so that the parent could be free to engage in activities with the younger child.

9. *"Family Emergency Insurance."* Many families in poverty live on the edge of disaster. They are barely able to get along. If a child becomes ill, the parent cannot afford to stay home from work. If the car, or the home heater breaks down, there is no money for repairs. And if the parent himself becomes ill, even when the medical bills are paid for, there may be no one to take care of the children. In middle class families these are temporary emergencies that can be handled by dipping into the reserve. In poor families, the temporary emergency can precipitate enduring family breakdown. A Federally sponsored "Family Emergency Insurance" at low premium rates that would pay for itself but could be drawn upon quickly when misfortune struck could help forestall family disruption and thus sustain the development of the child.

10. *Parent Intervention through Television.* Most American families consist of two parents, one or more children, and a television set. The segregation by age which characterizes American society at large (Bronfenbrenner 1970, 1972b) is reflected in television by separate programming for parents and children. The power of television to facilitate the child's cognitive development has been demonstrated by the evaluation of the effects of "Sesame Street" (Bogatz and Ball, 1971.)[19] If the findings of our analysis can be generalized, then the educational effects of children's television programs could be considerably enhanced by involving parents in activities with the children both on the screen, and, especially, in the home. Indeed, coordination of television programming with home visits and group meetings with parents could do a great deal to reinforce both parent and child in establishing developmentally advantageous patterns of interaction and activity. Finally, television programming could also enhance the status of parenthood in American culture. At the present time, the picture of the family presented on the television screen is either a fairy tale or a farce, with father and mother cast in highly stereotyped roles. There is little to suggest the challenge, complexity, and reward of being a parent, especially to fathers. Programs focused on these themes, addressed to both children and adults, could contribute to making parenthood a more attractive and respected activity in the eyes of children, parents, and the society at large.

VIII. FACTS AND PRINCIPLES OF EARLY INTERVENTION: A SUMMARY

The conclusions of this analysis are presented in the form of a summary of the research findings and a set of generalizations to which they give rise.

A. Summary of Research Results

1. *Preschool Intervention in Group Settings.* The results are based on twelve studies involving children ranging in age from one to six. Eight of these researches included comparisons between randomly constituted experimental and control groups. Conclusions regarding program effectiveness are cited only if supported by results from such comparisons.
   a) Almost without exception, children showed substantial gains in IQ and other cognitive measures during the first year of the program, attaining or even exceeding the average for their age.
   b) Cognitively structured curricula produced greater gains than play-oriented nursery programs.
   c) Neither earlier entry into the program (from age one) nor a longer period of enrollment (up to five years) resulted in greater or more enduring cognitive gains.
   d) By the first or second year after completion of the program, sometimes while it was still in operation, the children began to show a progressive decline, and by the third or fourth year of follow-up had fallen back into the

[19] For example, children who viewed the program over a two-year period showed 9 to 15 point gains in IQ on the Peabody Picture Vocabulary Test. These children and their families of course represent a self-selected group, especially in terms of motivation, so that it is difficult to know how much of the effect is attributable to the program itself.

problem range of the lower 90's and below. Apparent exceptions to this general trend turned out to be faulted by methodological artifacts (e.g. self-selection of families in the experimental group).

e) The period of sharpest decline occurred after the child's entry into regular school. Preliminary data from the Follow-Through program suggest that this decline may be offset by the continuation of intervention programs, including strong parent involvement, into the early grades.

f) The children who profited least from the program, and who showed the earliest and most rapid decline, were those who came from the most deprived social and economic backgrounds. Especially relevant in this regard were such variables as the number of children in the family, the employment status of the head of the household, the level of parents' education, and the presence of only one parent in the family.

g) Results from a number of studies pointed to factors in and around the home as critical to the child's capacity to profit from group programs both in preschool and in the elementary grades. For example, several researches revealed that the greatest loss in cognitive performance of disadvantaged children took place not while they were in school, but over the summer months. During this same period, disadvantaged children living in favorable economic circumstances not only maintained their status but showed significant gains.

2. *Home-based Tutoring Programs.* The results of the two studies in this area were similar to those for preschool programs in group settings. Children showed dramatic gains in IQ while the project was in operation but began to decline once the home visits were discontinued.

3. *Parent-Child Intervention.* A total of nine studies, involving children from the first year of life through elementary school, focused simultaneously on parent and child (almost exclusively the mother) as the targets of intervention. In seven of these researches, the principle of random assignment (either of individuals or groups) was employed in the designation of experimental and control subjects. Again conclusions regarding program effectiveness are cited only when supported by results from comparisons of randomly constituted experimental and control groups.

a) Parent-child intervention resulted in substantial gains in IQ which were still evident three to four years after termination of the program (Gordon 1972, 1973; Levenstein 1972a). In none of the follow-up studies, however, had the children yet gone beyond the first grade.

b) The effects were cumulative from year to year, both during intervention (Levenstein 1972a) and, in some instances, after the program had ended (Gordon 1973 Levenstein 1972a).

c) The magnitude of IQ gain was inversely related to the age at which the child entered the program, the greatest gains being made by children enrolled as one and two year olds (Gilmer *et al.* 1970; Gordon 1972, 1973; Karnes *et al.* 1968, 1969a, 1969b, 1970; Levenstein 1972a; Radin 1969, 1972; Stanford Research Institute 1971a, 1971b).

d) Parent intervention was of benefit not only for the target child but also for his younger siblings (Gilmer *et al.* 1970; Klaus and Gray 1968, 1970).

e) Gains from parent intervention during the preschool years were reduced to the extent that primary responsibility for the child's development was assumed by the staff member rather than left with the parent, particularly when the child was simultaneously enrolled in a group intervention program (Gilmer *et al.* 1970; Karnes *et al.* 1969c).

f) By the time the child was five years old, parent intervention appeared to have little effect so far as gains in intellectual development are concerned. *But children who were involved in an intensive program of parent intervention during, and, especially, prior to their enrollment in preschool or school, achieved greater and more enduring gains in the group program* (Gilmer *et al.* 1970; Gordon 1972, 1973; Radin 1969, 1972; Stanford Research Institute 1971a, 1971b; Smith 1968). This effect on group programs did not appear until children were at least three years of age, but was still strongly in evidence in the one project in which parent intervention was continued through the sixth grade (Smith 1968). Thus,

from the third year onward, parent intervention seemed to serve as a catalyst for sustaining and enhancing the effects of group intervention.

g) Parent intervention influenced the attitudes and behavior of the mother not only toward the child but in relation to herself as a competent person capable of improving her own situation (Gilmer *et al.* 1970; Gordon 1973; Karnes *et al.* 1970).

h) Families willing to become involved in parent intervention programs tended to come from the upper levels of the disadvantaged population. Research findings indicate that, at the most deprived levels, families are so overburdened with the task of survival that they have neither the energy nor the psychological resources necessary to participate in an intervention program involving the regular visit of a stranger to the home (Klaus and Gray 1968; Radin and Weikart 1967).

i) The complexity of findings on the effects of parent intervention prompted a more detailed analysis of the role of parent-child interaction in fostering the child's psychological development. An examination of the research literature (Bronfenbrenner 1968a, 1968b, 1972) indicated that, in the early years of life, the key element was the involvement of parent and child in verbal interaction around a cognitively challenging task. A second critical feature was the fact that the mother not only trained the child but the child also trained the mother. A third factor was the existence of a mutual and enduring emotional attachment between the child and adult. It is by capitalizing on all these elements, by taking as its focus neither the child nor the parent but the parent-child system, that parent intervention apparently achieves its effectiveness and staying power. It is as if the child himself had no way of internalizing the processes which foster his growth, whereas the parent-child system does possess this capability.

j) Along with advantages, parent intervention appears to have serious limitations in terms of its applicability and effectiveness with families at the lowest extreme of the socioeconomic distribution.

4. *Ecological Intervention.* The research results indicate that for the children from the most deprived groups no strategy of intervention is likely to be effective that focuses attention solely on the child or on the parent-child relationship. The critical forces of destruction lie neither within the child nor within his family but in the desperate circumstances in which the family is forced to live. What is called for is intervention at the *ecological level*, measures that will effect radical changes in the immediate environment of the family and the child. Only three studies of this kind were found in the research literature (Heber, *et al.*, Rehabilitation of Families at Risk for Mental Retardation 1971; Skeels 1966; Skodak and Skeels 1949). The major findings were as follows:

   a) *Severely disadvantaged children of mothers with IQ's well below average (i.e. below 70 or 80) are not doomed to inferiority by unalterable constraints either genetic or environmental.*

   b) Substantial changes in the environment of the child and his principal caretakers can produce positive developmental changes considerably greater (gains of 25 to 28 IQ points) and more enduring than those achieved by the most effective intervention techniques when the home environment is left essentially unaltered.

   c) The processes and effects produced through ecological intervention substantiate the critical role in early development played by an enduring one-to-one relationship involving the child in verbal interaction with an adult around cognitively stimulating activities.

B. Some Principles of Early Intervention.

The principles are stated in the form of propositions specifying the elements that appear essential for early intervention programs to be effective. Although derived from results of a substantial number of studies by different researchers, these generalizations should still be regarded as tentative. Even where the supportive findings have been replicated, they are susceptible to alternative interpretations, and the crucial experiments are yet to be done.

To indicate the extent to which each of the following generalizations are supported by research results, we shall label each one by a symbol. The superscript "i" denotes that the conclusion is *inferred* from the evi-

dence; the superscript "r" means that the generalization is supported by *replicated results* obtained in two or more well-designed studies described in the main body of this analysis, but that there is need for further research designed specifically to test and refine the proposition in question.

I. *General Principles*[20]

1. *Family Centered Intervention.* The evidence indicates that the family is the most effective and economical system for fostering and sustaining the development of the child.[r] The evidence indicates further that the involvement of the child's family as an active participant is critical to the success of any intervention program.[r] Without such family involvement, any effects of intervention, at least in the cognitive sphere, appear to erode fairly rapidly once the program ends.[r] In contrast, the involvement of the parents as partners in the enterprise provides an on-going system which can reinforce the effects of the program while it is in operation, and help to sustain them after the program ends.[r]

2. *Ecological Intervention.* The first and most essential requirement is to provide those conditions which are necessary for life and for the family to function as a childrearing system.[r] These include adequate health care, nutrition, housing, employment, and opportunity and status for parenthood.[i] These are also precisely the conditions that are absent for millions of disadvantaged families in our country.[r]

To provide the conditions necessary for a family to function will require major changes in the institutions of the society and the invention of new institutional forms.[i] The results of this analysis offer no guidance on the development of new systems for providing adequate health care, nutrition, housing, or income, but they do suggest strategies for increasing opportunity and social reward for the functions of parenthood. These include extending the number and status of part-time jobs available to disadvantaged parents of young children,[i] establishing more flexible work schedules,[i] introducing parent apprentice programs in the schools to engage older children in supervised care of the young,[i] involving parents in the work of the school,[r] creating patterns of mutual assistance among disadvantaged families living in the same neighborhood,[i] meeting the basic needs of young families, (including supervised experience in child care) before they begin to raise children,[i] providing homemaker services,[i] making available insurance to meet family emergencies,[i] and using television as an adjunct to parent-child intervention.[21]

3. *A Sequential Strategy of Intervention.* A long-range intervention program may be viewed in terms of five stages. Although the program may be begun with benefit to the child at any age,[r] initiating appropriate intervention at earlier stages can be expected to yield cumulative gains.[r] Ideally intervention should not be interrupted (for then the gains achieved are gradually eroded[r]) and there should be continuity from one phase to the next.[i] During every stage the first requirement is to meet the family's basic needs as outlined above.[i] Thereafter, intervention is differentiated to accommodate the developmental level of both family and child as indicated below.

C. Stages of Intervention.

Stage I. Preparation for Parenthood.

Ideally, intervention begins before the family is formed when the future parents are still in school. This initial phase involves providing school children of both sexes practicum experiences in the care of the young.[i] In addition, attention is given to the health requirements of the future mother in terms of nutrition and preventive medical care.[i]

Stage II. Before Children Come.

The next critical point for intervention is after the family is formed but before any children are born. Here the initial emphasis is to insure adequate housing, health care, nutrition, and economic security before, during, and after pregnancy.[i] This is also the optimal period for introducing a parent intervention program with some experience with young children provided before the family's own offspring arrive on the scene.[i]

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[20] The propositions are stated in terms of parent rather than mother alone in the belief that subsequent research will indicate that they apply as well to the father, or any other older member of the household who is prepared to assume a major and continuing responsibility for the care of the child.

[21] A more extended discussion of the rationale and nature of the foregoing proposals appears in Bronfenbrenner 1972b.

Stage III. The First Three Years of Life.

During this period the primary objective is the establishment of an enduring emotional relationship between parent and infant involving frequent reciprocal interaction[r] around activities which are challenging to the child.[r] The effect of such interaction is to strengthen the bond between parent and child,[r] enhance motivation,[r] increase the frequency and power of contingent responses,[r] produce mutual adaptation in behavior,[r] and thereby improve the parent's effectiveness as a teacher for the child,[!] further the latter's learning,[r] and, in due course, establish a stable interpersonal system capable of fostering and sustaining the child's development in the future.[r] The development of such an enduring pattern of attachment and interaction can be facilitated through a parent intervention program involving the following elements

1. The program includes frequent home visits in which parent and child are encouraged, by example and with the aid of appropriate materials, to engage in sustained patterns of verbal interaction around tasks which gradually increase in cognitive complexity as a function of the child's development.[r]
2. The parent devotes considerable periods of time to activities with the child similar to those introduced during the home visit.[r]
3. The role of the parent as the primary agent of intervention is given priority, status, and support from the surrounding environment.[r] Intervention programs which cast the parent in a subordinate role or have the effect of discouraging or decreasing his participation in activities with the child are likely to be counter-productive.[r]
4. The effectiveness and efficiency of parent intervention can be increased by extending activities so as to involve all the members of the family.[!] In this way the effects of vertical diffusion to younger siblings can be maximized[r] while older family members, including father, relatives, and older brothers and sisters, can participate as agents of intervention.[!] Such expansion, however, should not be allowed to impair the formation and uninterrupted activity of enduring one-to-one relationships so essential to the development of the young child.[!]
5. The effectiveness and efficiency of parent intervention can be enhanced through group meetings designed to provide information, to demonstrate materials and procedures, and to create situations in which the confidence and motivation of parents (and other family members) is reinforced through mutual support and a sense of common purpose.[r] Such meetings, however, must not be allowed to take precedence over home visits or the periods which the parent devotes to playing and working with the child.[r]

Stage IV. Ages Four through Six.

During this period, exposure to a cognitively oriented preschool curriculum becomes a potent force for accelerating the child's cognitive development,[r] but a strong parent intervention program is necessary to enhance and sustain the effects of the group experience.[r] This combined strategy involves the following features.

1. The effectiveness of preschool experience in a group setting is enhanced if it is *preceded* by a strong parent intervention program involving regular home visits.[r]
2. After preschool begins, the parent program must not be relegated to secondary status if it is to realize its potential in conserving and facilitating the effects of group intervention.[r] Both phases of the combined strategy should reinforce the parents' status as central in fostering the development of the child.[!] A program which places the parent in a subordinate role dependent on the expert is not likely to be effective in the long run.[r]

Stage V. Ages Six through Twelve.

Of especial importance for sustaining the child's learning in school is the involvement of parents in supporting at home the activities engaged in by the child at school and their participation in activities at school directly affecting their child.[!] The parent, however, need no longer be the child's principal teacher as at earlier stages. Rather he acts as a supporter of the child's learning both in and out of school, but continues to function, and to be identified by school personnel, as the primary figure responsible for the child's development as a person.[!]

Taken as a whole, the foregoing principles imply a major reorientation in the design of intervention programs and in the training of personnel to work in this area. In the past, such programs were primarily child-centered, age-segregated, time-bound, self-centered, and

focused on the trained professional as the powerful and direct agent of intervention with the child. The results of this analysis point to approaches that are family-centered rather than child-centered, that cut across contexts rather than being confined to a single setting, that have continuity through time, and that utilize as the primary agents of socialization the child's own parents, other family members, adults and other children from the neighborhood in which he lives, school personnel, and other persons who are part of the child's enduring environment. It is beyond the scope of this paper to attempt to spell out the implication of this reorientation for the organization of services, delivery systems, and training. Many developments in the desired direction are already taking place. It is hoped that this analysis may accelerate the process of social change in the major institutions of our nation directly affecting the lives of young children and their families.

In completing this analysis, we reemphasize the tentative nature of the conclusions and the narrowness of IQ and related measures as aspects of the total development of the child. We also wish to reaffirm a deep indebtedness to those who conducted the programs and researches on which this work is based, and a profound faith in the capacity of parents, of whatever background, to enable their children to develop into effective and happy human beings, *once our society is willing to make conditions of life viable and humane for all its families.*

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